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LAND USE AND URBAN DEVELOPMENT IMPACTS OF BART

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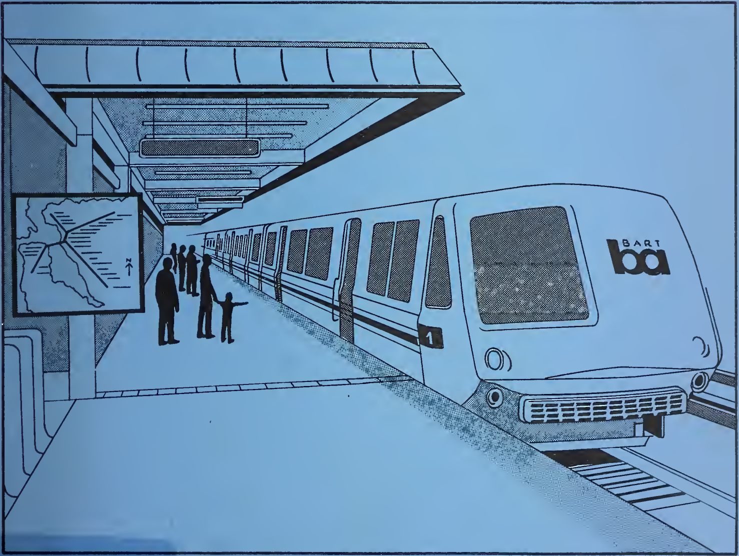

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IAL REPORT

APRIL 1979

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Abstract

This report assesses the land use and urban development impacts of the 71-mile Bay Area Rapid Transit (BART) system, the first rail transit system to be built in the United States in 50 years. How and to what extent BART has influenced the spatial arrangement of people and activities in the San Francisco Bay Area is documented. All aspects of development that BART may have affected or potentially could affect are examined — including households' and workers' location decisions, development decisions of housing and commercial developers, retail trade and shopping patterns, and property values and rents. Changes attributable to BART are measured against pre-BART and no-BART alternatives using a variety of analytical techniques, surveys, statistical analyses and case studies. The report concludes with an assessment of the policy implications of the BART experience to date.

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BART IMPACT PROGRAM

THE LAND USE AND URBAN DEVELOPMENT IMPACTS OF BART

FINAL REPORT

DOT-BIP-FR-14-5-78

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PREPARED FOR

U.S. DEPARTMENT OF TRANSPORTATION

AND

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

The BART Impact Program is a comprehensive, policy-oriented study and evaluation of the impacts of the San Francisco Bay Area's new rapid transit system (BART).

The program is being conducted by the Metropolitan Transportation Commission, a nine-county regional agency established by state law in 1970.

The program is financed by the U. S. Department of Transportation, the U. S. Department of Housing and Urban Development, and the California Department of Transportation. Management of the federally funded portion of the program is vested in the U. S. Department of Transportation.

The BART Impact Program covers the entire range of potential rapid transit impacts, including impacts on traffic flow, travel behavior, land use and urban development, the environment, the regional economy, social institutions and lifestyles, and public policy. The incidence of these impacts on population groups, local areas, and economic sectors will be measured and analyzed. Finally, the findings will be interpreted with regard to their implications for the planning of transportation and urban development in the Bay Area and other metropolitan areas.

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SPONSOR'S NOTE

The BART Impact Program was a comprehensive, policy-oriented study and evaluation of the impacts of the San Francisco Bay Area's new rapid transit system (BART). The program began in 1972, and was completed in 1978. Financing for the Program was provided by the U.S. Department of Transportation, the U.S. Department of Housing and Urban Development, and the California Department of Transportation. Management of the Federally-funded portion of the Program was vested in the U.S. Department of Transportation (DOT). The Metropolitan Transportation Commission (MTC), a nine-county regional agency established by California law in 1970, administered the Program as prime contractor to DOT; the research was performed by competitively selected subcontractors to MTC.

The BART Impact Program studied the broadest feasible range of potential rapid transit impacts, including impacts on traffic flow, travel behavior, land use and urban development, the environment, the regional economy, social institutions and life styles, and public policy. The incidence of these impacts on population groups, local areas, and economic sectors was measured and analyzed.

The results of the BART Impact Program have been synthesized in BART in the Bay Area, the BART Impact Program Final Report (PFR). That report was prepared by MTC and presents MTC's conclusions from and interpretation of the Program's findings. In addition to the PFR, final reports for each of the individual projects in the Program were prepared by the consultants who conducted the research. The reports are listed at the end of this Note. The final reports are supported by numerous technical memoranda and working papers. The conclusions in those documents reflect the viewpoints of the respective consultants based on their research.

Readers of BART Impact Program reports should be aware of the circumstances and the setting in which BART was planned and built and the conditions under which the Program was conducted. An understanding of these factors is critical for interpreting the Program's findings and attempting to apply them to other areas.

First, it is important to note that the San Francisco Bay Area has a sound economy, a good system of highways and public transportation, and distinctive land use and development patterns shaped by the Bay and the hills around it. BART was approved and built during a period of vigorous growth in the Bay Area. The economy was expanding, suburban development was burgeoning, and major increments of highway capacity were being added. Also, the Bay Area already had extensive public transportation services. There were public carriers operating dense networks of local transit services on both sides of the Bay, and there was frequent transbay bus service from many parts of the East Bay to San Francisco. In 1972 before BART opened, approximately 10% of the total daily trips in the three BART counties were made on transit. All of these factors made it difficult in the study to isolate BART's effects from other influences that were affecting such things as travel behavior and urban development.

A second important point is that BART was planned and designed primarily to facilitate travel from outlying suburbs to downtown areas. Multiple stops are provided in the major central business districts, but in other respects BART is more like a commuter rail system (with long lines and widely-spaced stations) than a New York or Chicago-style subway system of interlocking crosstown lines and frequent stops. The BART system was intended to rival the automobile in comfort, speed, and convenience. Contemporary issues like energy conservation, air quality and service for the transportation disadvantaged were not widely recognized and publicized concerns during the period of BART's design.

The institutional setting in the Bay Area was a third important influence on BART's development. BART was developed as a separate institution without full coordination among existing transportation and regional development planning agencies. BART's planners had to make assumptions about policies and development, many of which turned out to be contrary to policies ultimately adopted by municipalities in the BART District.

A critical element in the study design of the BART Impact Program was the definition of the No-BART Alternative (NBA), the regional transportation facilities and travel patterns judged most likely to have evolved by 1976 if BART had not been built. The definition of an NBA was essential since the Program defined an impact as the difference between what actually occurred with BART and what would have resulted without BART. One cannot be certain about what the region would have been like had BART not been built. But based on an analysis of the political and economic decision history of the Bay Area and the professional judgment of those involved in the Program, it was determined that no significant changes to the area's freeway and bridge systems as they actually were in 1976 would have occurred without BART. It was concluded further that the public transit network and services would have been very similar to what they were just before the start of BART transbay service. One consequence of this assumption is that the NBA provides lower levels of service and less capacity than the with-BART system, and attracts fewer riders. The NBA does not extrapolate beyond 1976 and does not consider how much additional capacity in the transportation system might eventually have been required because of increasing travel demand and congestion.

An important factor affecting the findings was that BART was not operating at its full service level during the period of study by the BART Impact Program. The frequency of trains, their operating speeds, the reliability of their operations, and the capacities provided in peak periods of travel by BART were considerably lower than those originally planned. Trains were running on 12-minute headways instead of the 4.5 minutes originally planned for each of the four lines (90 seconds where three lines converged). BART did not initiate service on all lines simultaneously in 1972 but instead phased in service. The most critical link, the Transbay Tube, was not opened until late 1974. Night service did not start until the end of 1975, and Saturday service started in 1977. Direct Richmond to Daly City service still is not operating, and it now appears that "full service levels," when they are attained, will not achieve the headways and average speeds announced in the original plans.

The final point is that BART had only been operating for a relatively short period of time when its impacts were studied. The impact assessment largely depends on data collected in the first four years of BART's operations. It is likely that some of its impacts, particularly those relating to urban development, will require more time to mature.

Final Reports

These documents are available to the public through the National Technical Information Service, Springfield, VA 22151:

Metropolitan Transportation Commission, "BART in the Bay Area. The Final Report of the BART Impact Program," MTC, 1979.

Gruen Associates, Inc. and DeLeuw, Cather & Company, "Environmental Impacts of BART," MTC, 1979.

Peat, Marwick, Mitchell & Co., "BART's First Five Years: Transportation and Travel Impacts," MTC, 1979.

Jefferson Associates, Inc., "Impacts of BART on Bay Area Institutions and Life Styles," MTC, 1979.

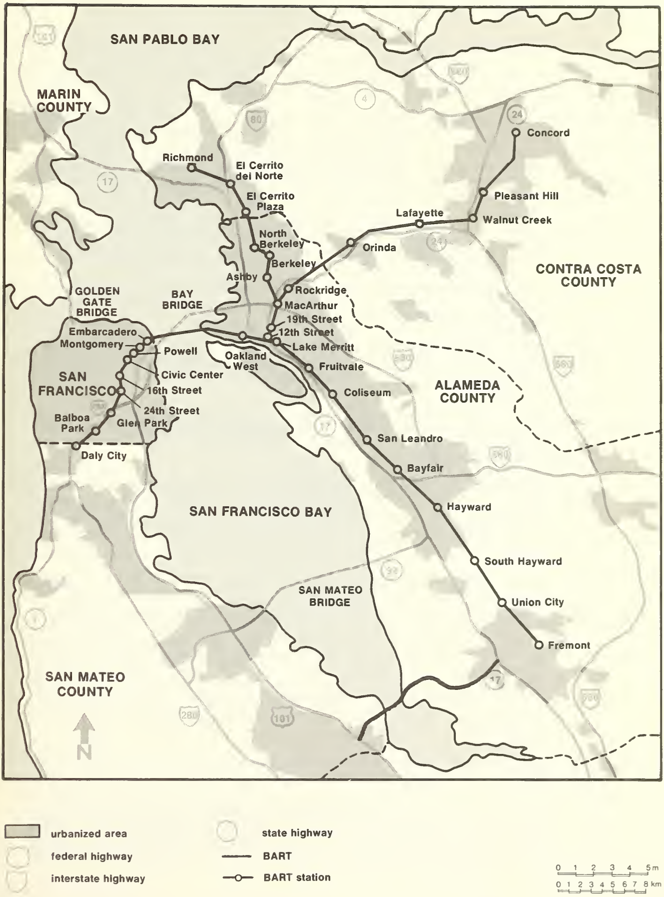
McDonald & Grefe, Inc., "The Economic and Financial Impacts of BART," MTC, 1979.

John Blayney Associates/David M. Dornbusch & Co., Inc., "Land Use and Urban Development Impacts of BART," MTC, 1979.

Booz, Allen & Hamilton Inc., "The Impact of BART on Public Policy," MTC, 1979.

Urban Dynamics Associates, "Implications of BART's Impacts for the Transportation Disadvantaged," MTC, 1978.

Alan M. Voorhees & Associates, Inc., "Federal Policy Implications of BART," DOT, 1979.


SAN PABLO BAY
MARIN COUNTY
101
80
4
680
24
17
Concord
Richmond
El Cerrito del Norte
El Cerrito Plaza
Pleasant Hill
Lafayette
Walnut Creek
North Berkeley
Orinda
24
Berkeley
Ashby
CONTRA COSTA COUNTY
GOLDEN GATE BRIDGE
BAY BRIDGE
Rockridge
MacArthur
19th Street
12th Street
Embarcadero
Montgomery
Lake Merritt
Powell
Oakland West
580
680
Fruitvale
Civic Center
SAN FRANCISCO
16th Street
Coliseum
ALAMEDA COUNTY
280
24th Street
Balboa Park
Glen Park
17
San Leandro
Daly City
580
Bayfair
Hayward
SAN FRANCISCO BAY
South Hayward
92
SAN MATEO BRIDGE
Union City
1
Fremont
SAN MATEO COUNTY
17
680
280
101
N
urbanized area
federal highway
interstate highway
state highway
BART
BART station
0 1 2 3 4 5 m
0 1 2 3 4 5 6 7 8 km

BART: The Bay Area Rapid Transit System

Length: The 71-mile system includes 20 miles of subway, 24 miles on elevated structures and 27 miles at ground level. The subway sections are in San Francisco, Berkeley, downtown Oakland, the Berkeley Hills Tunnel and the Transbay Tube.

Stations: The 34 stations include 13 elevated, 14 subway and 7 at ground level. They are spaced at an average distance of 2.1 miles: stations in the downtowns are less than one-half mile apart, while those in suburban areas are two to four miles apart. Parking lots at 23 stations have a total of 20,200 spaces. There is a fee (25 cents) at only one of the parking lots. BART and local agencies provide bus service to all stations.

Trains: Trains are from 3 to 10 cars long. Each car is 70 feet long and has 72 seats. Top speed in normal operations is 70 mph with an average speed of 38 mph including station stops. All trains stop at all stations on the route.

Automation: Trains are automatically controlled by the central computer at BART headquarters. A train operator on board each train can override automatic controls in an emergency.

Magnetically encoded tickets with values up to $20 are issued by vending machines. Automated fare gates at each station compute the appropriate fare and deduct it from the ticket value.

Fares: Fares range from 25 cents to $1.45, depending upon trip length. Discount fares are available to the physically handicapped, children 12 and under, and persons 65 and over.

Service: BART serves the counties of Alameda, Contra Costa and San Francisco, which have a combined population of 2.4 million. The system was opened in five stages, from September 1972 to September 1974. The last section to open was the Transbay Tube linking Oakland and the East Bay with San Francisco and the West Bay.

Routes are identified by the terminal stations: Daly City in the West Bay, Richmond, Concord and Fremont in the East Bay. Trains operate from 6:00 a.m. to midnight on weekdays, every 12 minutes during the daytime on three routes: Concord-Daly City, Fremont-Daly City, Richmond-Fremont. This results in 6-minute train frequencies in San Francisco, downtown Oakland and the Fremont line where routes converge. In the evening, trains are dispatched every 20 minutes on only the Richmond-Fremont and Concord-Daly City routes. Service is provided on Saturdays from 9 a.m. to midnight at 15-minute intervals. Future service will include a Richmond-Daly City route and Sunday service.* Trains will operate every six minutes on all routes during the peak periods of travel.

Patronage: Approximately 146,000 one-way trips are made each day. Approximately 200,000 daily one-way trips are anticipated under full service conditions.

Cost: BART construction and equipment cost $1.6 billion, financed primarily from local funds: $942 million from bonds being repaid by the property and sales taxes in three counties, $176 million from toll revenues of transbay bridges, $315 million from federal grants and $186 million from interest earnings and other sources.

March 1978

*Sunday service began in July, 1978

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SUMMARY FINDINGS AND CONCLUSIONS

The major objective of the Land Use and Urban Development Project of the BART Impact Program was to determine how and to what extent the 71-mile BART system, the first new rail rapid transit system to be built in the United States in 50 years, has influenced the spatial distribution of people and activities within the San Francisco Bay Area, and whether the early expectations of BART's impacts on urban form have been realized. With this goal in mind, the study of BART's impacts on land use became a study of urbanization in the Bay Area during the past 15 years. Every aspect of development that BART may have affected -- employers' location decisions, workplace and residence location decisions, development decisions, retail trade, property values and rents, speculation -- was examined with the objective of identifying and measuring BART's effects. Changes both in the immediate vicinity of BART stations and in development patterns at the regional scale were analyzed.

The principal findings of this study are summarized in the following sections.

BART'S OVERALL EFFECTS

BART has influenced land use and urban development in the Bay Area both directly (through its service and its local physical effects) and indirectly (by affecting zoning regulations, redevelopment financing, and civic improvements). To date, the effects have been small, relative to expectations, but not inconsequential.

To a limited extent, both office and housing construction have been influenced by BART, and the BART system is becoming a common, though not highly ranked, factor in the location decisions of households and employers.

BART has been less influential in the sphere of retail activity. Retailers almost completely disregard BART in their location decisions. Sales data show no advantages for stores with near-BART locations, although a few merchants near BART stations feel that location enhances their sales. BART is being used to reach downtown shopping districts and outlying retail areas, and survey data suggest that a potential shift in shopping patterns toward three BART-served areas has occurred. BART has affected property prices and rents, but the impacts are small. At a regional scale, BART has not had a measurable impact on population and employment growth, but development in BART-served corridors and downtown is somewhat greater than it would have been had BART not been built, indicating a distributional effect.

Many projected land use impacts have not been realized. For example, high density residential development has not occurred in BART station areas zoned for such uses. Possible reasons for the lack of development include insufficient time for the effects to occur (the minimal mobility advantages produced by BART), zoning restrictions in some locations, and simply the absence of demand for such development in the particular areas chosen for station locations when larger, alternative sites are available in the same market area.

BART'S CONSTRUCTION IMPACTS

Land Acquisition and Disposition

Overall, BART's consumption of land and property for the line, stations, and yards has not been extremely disruptive. Only a thousand or so acres were acquired, most of which were undeveloped or already used for transportation purposes. Of the 3,000 households and 450-500 businesses displaced, most appear to have relocated within their community. Problems encountered due to inadequate financial assistance for relocation mainly were due to the less demanding state and federal standards applicable in the 1960s when BART made most of its land purchases. Consequently, BART's relocation program largely was unaffected by the 1970 federal Uniform Relocation Assistance and Real Estate Property Acquisition Act which increased the compensation available to those displaced by public projects.

BART has sought to put its surplus properties (86 acres) to use by obtaining rental income from short-term leases, negotiating interagency transfers and sales to adjacent owners, and offering prime parcels at public auctions. In the main, BART has been quite successful at implementing its policies for disposal of surplus properties. The only major problems occurred in Berkeley where community opposition has blocked a number of development proposals. Ultimately, though, the responsibility for planning to optimize reuse of surplus properties rests with local governments, not BART.

Effects on Adjacent Properties and Retail Sales

No negative effects on maintenance, rehabilitation or new construction can be attributed to BART's construction activities. On the other hand, BART's construction evidently caused or contributed to declining retail sales in several areas. According to several sources, sales of marginal businesses serving low-income and minority areas were more adversely affected than other businesses. In downtown San Francisco, BART stimulated the Market Street beautification project, which prolonged the period of disruption. In all, Market Street underwent streetwork for nearly 10 years. Unless special reparation programs had been devised, however, there seems to have been no way these consequences could have been avoided.

IMPACTS ON ACCESSIBILITY AND MOBILITY

BART's impacts on accessibility and mobility provide a framework for assessing land use changes to date. Changes in accessibility are measured in terms of travel time savings without considering the number of people benefitting from a transportation improvement. Mobility, on the other hand, expresses actual trip time differences and demonstrates the degree to which potential travel time savings are realized by the system's users. For analytical purposes, BART's service was compared with a hypothetical transportation system, the No-BART Alternative (NBA), which might have been operational in 1976 had the 1962 decision to build BART not been made. Essentially, the NBA is the 1971 regional transportation system with minor improvements in bus service.

BART offers an improvement in areawide accessibility to about 34 percent of the service area population living in Alameda, Contra Costa, San Francisco and northern San Mateo Counties, with an average improvement in peak hour transit travel time of 14 minutes per trip (13 percent) over the NBA. However, BART has had a considerably smaller impact on mobility. It has shortened the average work trip on transit to major employment centers (such as downtown San Francisco and Oakland) by 8.7 minutes (20 percent), and has shortened the average shopping trip to San Francisco, Oakland, and three other shopping areas by 2.8 minutes (8 percent). On the other hand, trips by car to the top 50 employment centers in the service area average 26 minutes during peak periods vs. 40 minutes on BART -- a 35 percent different favoring automobile travel. This demonstrates that the accessibility improvement BART offers still is not superior to highway travel for most trips.

IMPACTS ON LOCATION DECISIONS

Workers' Location Decisions

An individual's choice of job typically does not revolve around the job's location. According to a 1977 survey, fewer than 10 percent of those who work near BART stations included transportation factors in their job choice. Nevertheless, the desirability of any given job location is often a function of BART accessibility. Among survey respondents who had recently changed or obtained jobs, one worker in four sought his or her job with the intention of commuting by BART. Since the survey sample was stratified so that half the respondents were BART riders, BART's influence is overstated. BART's influence was strongest for San Francisco workers living in the East Bay; 57 percent cited BART as a consideration in choosing a job location. Because only 40 percent of the people who claimed they could use BART to commute actually did use BART, there appears to be potential for a considerable increase in BART's use by Bay Area workers.

Households' Location Decisions

BART has had virtually no influence on the initial decisions to move, and has not stimulated moves out of older, urban residential areas, according to a survey of recent movers. However, in the choice of where to move, BART is becoming a common decision factor. Half of the survey respondents considered access to BART in their selection of a place to live. Compared to other decision factors, being near BART is relatively minor, typically ranking sixth to tenth behind considerations such as housing type, general access to workplace, and neighborhood characteristics. One in five of the movers surveyed expressed a willingness to pay more for a location near BART.

BART's importance in the residential location decision increases with commute time, whereby long distance commuters tend to be more affected by BART in their housing decisions. As a corollary, BART has had a greater effect on moves to or within suburban locations than to inner city locations. Individuals in the middle and upper income brackets more frequently considered BART in their location decisions than did low income movers.

For many suburban commuters, BART may represent a means of keeping their transportation options open should congestion reach intolerable levels or gasoline shortages curtail automobile use. This interpretation also is supported by the finding that suburban homeowners were more apt to seek a near-BART location than were renters. Since home purchase involves a considerable investment, owners are more likely to adopt a long-term perspective in residence choice.

Employers' Location Decisions

Public transportation in general, and BART in particular, were found to be minor factors in most firms' locational choices. Although several informants (13 out of 50) noted that access to the labor force was considered in their firms' location decisions, the factor typically ranked lower than site availability, price, and proximity to other firms. BART is not valued highly because it represents only a marginal improvement in the regional transportation system. Moreover, patronage has not yet reached predicted levels, full service has not yet begun, and well-publicized operational problems still plague the system.

In 71 interviews with individuals familiar with the firms' location decision (representing 50 different employers), five major employers indicated their decisions were influenced by BART. Three of the five employers were governmental agencies (Social Security Administration, California Department of General Services, Energy Resources Development Administration), and the others were large, private firms (Clorox, Blue Cross). All the locations are in inner cities — Oakland, San Francisco, and Richmond.

Banks and savings and loan institutions attempt to anticipate development trends in their location decisions. Although cognizant that BART may influence growth, none of the seven financial institutions interviewed specifically had located new branches in anticipation of BART-related development, nor was it found that other businesses moved due to expectations of such growth.

With one exception (Social Security Administration Regional Payments Center in Richmond), major employers have not been drawn to station areas in economically declining areas. BART's inability to invigorate such station areas with new business activity supports the argument that in the absence of existing demand for new commercial space, a new transit system will not induce such development.

Again, at the regional level there is no evidence of BART affecting either centralization or decentralization of business districts. Only the Social Security Administration cited BART among its reasons for moving to a 'less central' location (from San Francisco to Richmond). On the other hand, the interviews showed that BART has encouraged some firms to remain in the city centers, and in this manner BART may be helping to maintain the preeminence of the Bay Area's traditional city centers.

IMPACTS ON DEVELOPMENT DECISIONS

Office Construction

BART has not caused a redistribution of office space in the Bay Area. Although building permit data show that BART-served suburban communities have substantially increased their share of new office construction in the three-county BART District, from 6 percent in 1963-65 to 14 percent in 1974-76, the increase cannot be attributed solely to BART. Rapid population growth in these areas, combined with favorable land prices and availability, appear to be the driving force behind the suburban office expansion. Only minor increases in the suburban population may be attributable to BART, so BART's indirect effects on office construction in these communities is minimal. No offices were found to be induced by BART to locate in the suburbs instead of central cities. [1]

Apparently BART has not initiated a trend toward greater centralization in the traditional city centers. Since BART's planning in the early 1960s, San Francisco and Oakland's share of regional office construction declined slightly (from 80 percent to 75 percent in the mid-1970s). Interviews with representatives of six new office-space users moving or recently moved to San Francisco

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1. The Social Security Administration's move to Richmond cannot be classified as a move to the suburbs, but rather to an older, less central urban area.

or Oakland, indicated that the moves were unrelated to BART. Further, informants were unable to identify any recently completed San Francisco office buildings that would have been located in another city had BART not been built.

Although BART, to date, has not caused a shift in the distribution of new office construction in the Bay Area, it has had important effects at the subregional level. Within San Francisco BART has influenced the location of seven major projects since 1965, and has contributed to a definite redirection of new office buildings toward Market Street. Formerly a relatively undesirable area, the Market/south of Market area has experienced a dramatic rise in its share of the downtown's major new office development, from virtually none before BART (1960-62) to 88 percent since BART's operation (1974-77).

Central to this redirection of office construction in San Francisco have been two events primarily attributable to BART: (1) the Market Street Development Project, a $35 million beautification effort, and (2) the adoption of new zoning provisions granting floor area ratio bonuses to buildings with direct entries to or located near a BART station. The provision of BART service itself was of minor importance; BART's major influence was indirect. Factors not related to BART (the availability and low price of land, constraints on growth in other directions, and access to other public transportation) would likely have produced a similar growth pattern even without BART, but BART probably has accelerated the redirection of the financial district's growth.

Four other communities have experienced increased office construction activity near BART stations (Oakland, Richmond, Berkeley, Walnut Creek), but BART has played a limited role in these shifts, according to knowledgeable observers.

Housing Construction

BART has affected the housing industry to some extent, but thus far the impacts have been different from what planners originally expected. No nodes of high density development have materialized at station areas. Several explanations may be offered for the absence of new, high density residential development at BART stations. In Rockridge, residents reacted to forecasts of BART-induced growth by supporting new zoning regulations that entirely barred higher density land use changes. New zoning to limit the intensity of new station area development was also passed in eight other station areas, precluding appreciable construction in these communities. Several communities have zoned land adjoining BART stations for high density development. Reasons for the lack of development in these areas are a lack of demand for high density residential development in the suburbs, continued automobile reliance and preference for single family dwellings of the suburban inhabitants, and possibly that six or fewer years of BART operation may not be enough to generate the expected impacts.

Residential developers indicate that BART has heightened the demand for housing in two areas (Pittsburg-Antioch in eastern Contra Costa County and Union City-Fremont in southern Alameda County) previously perceived as beyond commute distance to San Francisco and Oakland. It is likely that development there would have occurred eventually even without BART, given the scarcity of developable land near the major cities, the continued demand for single family dwellings, and the completion of several major highway improvements. BART, however, may have stimulated early growth of these peripheral areas by enhancing their accessibility to central employment locations.

BART appears to be having a decided impact upon developers' decision making processes. Two-thirds of the 26 developers interviewed claimed that BART was a "somewhat important" factor in their decision making. Half stated that they would pay a premium for developable land near a BART station. In addition, six large projects (together totalling 3,500 units) were identified where location, timing and/or density had been specifically intended to take advantage of BART service.

Near certain at-grade and elevated portions of the line, BART noise has been a deterrent to residential development. The area involved has been small; only along seven miles of track does BART noise exceed community noise levels. On a two-mile stretch of vacant land near that portion of the BART track, on land that otherwise would seem likely to have experienced some housing construction since 1965, no development has occurred. Representatives of five major developers confirmed that their decisions not to develop were influenced by the potential noise impacts from BART and the added costs of soundproofing required by California law for projects located in areas of excessive noise.

IMPACTS ON RETAIL SALES

Shopping Patterns

In addition to facilitating work trips, BART is being used to reach downtown shopping districts and outlying retail areas. A survey of 500 shoppers (weighted so that half the sample was composed of BART riders) indicated that BART may be causing some change in shopping patterns. One out of four shoppers interviewed who had increased their use of a BART-served shopping area since 1974 cited BART as the reason for the increase.

The survey results suggest a possible shift in shopping patterns, favoring downtown San Francisco, downtown Oakland, and Walnut Creek. In all three locations, shoppers who had patronized the area only since 1974 showed a significantly higher propensity to use BART for shopping than did others. Further, in Walnut Creek and San Francisco, more than 40 percent of the "new" shoppers surveyed claimed that BART was the reason they had begun to use the area.

According to the survey, BART is more commonly used for personal errands (doctor's appointments, banking) than for shopping, and, as would be expected, used more frequently in shopping for light household items, gifts, and personal items than for bulky items like groceries, furniture or appliances.

Retail Sales

A few merchants near BART feel that proximity to the stations has improved their sales. Eighteen percent of the merchants questioned (representing 11 shopping districts) believed BART to be having a positive effect on their sales. The others discerned no impact. However, data from 1970 to 1976 on taxable retail sales of stores in downtown San Francisco, Oakland, and Berkeley provide no evidence of a positive relationship between a location close to BART and growth in sales. Analyses of retail sales in other shopping areas in the BART service area were inconclusive as to the effects of being near BART stations.

IMPACTS ON PROPERTY PRICES AND OTHER REAL ESTATE MARKET EFFECTS

Residential Property Prices and Rents

Anticipated benefits from a location close to a BART station had a significant but marginal, positive impact on single family home prices within 500 to 1,000 feet of a station, according to a multiple regression analysis of price changes in six BART station areas. Since service began, this effect has disappeared and even turned negative where BART-related automobile traffic and parking have become a nuisance. The expected negative effect of being near BART tracks (either elevated or at-grade) was not found.

Residential rents in the locations studied apparently were unaffected by BART after service began, but this may be changing, at least in Walnut Creek, where some positive effects in recent years were noted.

Where there have been statistically significant BART impacts on prices and rents, they have been rather small in absolute terms, except in the most advantageous locations. On an aggregate level, however, BART may have raised areawide property prices and rents in certain locations, notably Walnut Creek and the Glen Park District in San Francisco. If so, BART has had a marginal distributional effect in the Bay Area by allocating some of the demand for higher priced housing to these areas.

Commercial Property Prices and Rents

Proximity to a BART station has affected office rents in San Francisco, Oakland and Walnut Creek, although in Oakland it was only the upper range of rentals (the prestigious offices) which were affected. The magnitude of the impact was largest in suburban Walnut Creek and smallest in San Francisco where it was marginal and virtually disappeared beyond 200 feet of a station. In each area the impact was noticeable only after BART transbay service began.

Because of lack of data, sales prices of commercial property were not investigated except in the Mission District of San Francisco. There it was found that proximity to the BART stations had had an impact early when it was anticipated that BART would bring an increase in customers near the stations (walk-in trade). Since these anticipations have largely failed to materialize, the reflection in commercial property prices also has disappeared.

In general, where professional judgments were available regarding BART's effect on prices and rents, they agreed very well with the analytical results.

Speculation

For the key informant interviewing done for this study, speculation was defined as the buying and/or holding of real property in expectation of profiting from changes in the market price not directly resulting from investment in the property itself. This definition excludes investment for multiple purposes, even if one of those purposes is speculation, in order to avoid inconsistencies and trivial results. The shortcoming of this exclusion was overcome by continuing the interview results with empirical analyses of data which do not distinguish between single and multiple purpose actions, but are indicative of any speculative motives.

Speculation has not been a prominent factor in BART station areas. Although speculation occurred in 13 of the 17 station areas studied, in no instance did it involve large-scale purchase or holding of land. Rather, it centered on small commercial and residential properties.

The level and type of activity varied considerably from community to community. For example, downtown San Francisco experienced no speculative activity, while in Oakland speculation occurred in both commercial land and in office buildings. Consistent patterns, however, were not discernible. Most of the speculative activity occurred around the time of BART station construction, when optimism and expectations of improvements to be provided by BART were running high. As delays and, later, service inadequacies reduced expectations, speculation diminished.

REGIONAL EFFECTS

BART's land use impacts have taken place primarily at the local rather than the regional level. BART has increased neither population nor employment in its three-county service area at the expense of other Bay Area counties. Growth continues to be most rapid in Santa Clara County, which is not served by BART. On the other hand, employment within the primary BART service areas has increased more rapidly than in other parts of the greater service area, and some employers have been attracted to station areas at least partly by BART. Regression analyses, however, did not show BART to be positively associated with employment increases.

Overall, areas with the greatest accessibility improvements and closest to BART stations have not experienced the greatest increases in population, but this was to be expected because BART was built to serve existing urban areas. Consequently, little new housing has been built within 1,500 feet of the BART stations, even where there was vacant land available, but regression analyses do show a positive relationship between BART proximity (weighted by patronage) and the change in occupied dwelling units.

A few residential developers were influenced by BART in selecting a site within a predetermined market area, but land developed as a result of BART was more or less in the path of development in any case. BART has not fostered urban sprawl, nor has it induced high density housing development in station areas.

Several reasons explain why most new development in BART station areas has consisted of commercial or institutional uses rather than housing. Zoning incentives encouraged commercial development in four cities, and in eight station areas downzoning precluded intensive residential development. Commercial uses affected by BART must be within walking distance of a station, while housing can benefit at a greater distance, especially where commuter park-and-ride lots are provided. Further, adequate demand may not exist for high density residential projects in the suburban areas appropriately zoned, but this may change because of parking problems at suburban stations and the high cost of new housing.

BART has not caused special impacts on minorities in terms of land use. It has not encouraged the out-migration of whites from the central cities, nor does it appear to have affected minorities' movements to the suburbs. BART has improved mobility for some minority households, but has not substantially enhanced inner city residents' accessibility to suburban employment locations. To date, there has been no measurable effect on minority "reverse commuting" to employment opportunities in the suburbs. BART may have reduced competition for inner city housing by increasing accessibility to outlying residential areas.

CONCLUSIONS

To date, BART appears to have had more of an effect on behavior patterns (shopping, workers' location) than on structure location decisions (offices, employers' location decisions, housing), suggesting that the most significant land use and urban development impacts, if they are to occur, are still years away. This conclusion stems from two findings. First, the impacts noted so far have been more behavioral than physical, and BART impacts on people's shopping patterns and choice of residence and workplace locations may eventually lead to some redistribution of shops, homes, and workplaces.

The second reason is that BART's impact on regional accessibility and mobility has been relatively small. Consequently, it is not surprising to find that BART's impact on land use and urban development has also been small. However, San Francisco's commercial center continues to grow, and the City's urban design plan will allow the downtown to triple its present commercial floor area. Residential development potential in San Francisco is extremely limited under present and proposed zoning, and many, if not most, of the future San Francisco workers will likely reside in the BART service area. Marginal improvements may be made in freeways and the efficiency of their use, but improvements can only slow the relentless increase in highway congestion. Therefore, BART's relative attractiveness as a transportation mode will increase as its own efficiency improves and as the highways, particularly the bridges into San Francisco, become more congested and delays more annoying.

1. INTRODUCTION

OBJECTIVES OF THE BART IMPACT PROGRAM AND THE PROJECT

As the first regional rapid transit system built in the United States in more than 50 years, the San Francisco Bay Area Rapid Transit System (BART) is a potential learning model for metropolitan areas now considering investments in transportation improvements, urban development, and environmental protection in urban areas. Initiated in 1972, the BART Impact Program was designed to meet the needs for accurate information on BART and to assist those making future transportation decisions in the Bay Area and throughout the nation.

The BART Impact Program (BIP) is a comprehensive, policy-oriented evaluation of the impacts of the BART system. The program covers the entire range of possible rapid transit impacts and includes major impact studies of Bay Area transportation systems comprising the following six major projects:

- Land Use and Urban Development Project
- Economics and Finance Project
- Environment Project
- Institutions and Lifestyle Project
- Public Policy Project
- Transportation System and Travel Behavior Project

Impacts are defined, then measured and analyzed as to their effects on population groups, local areas and economic sectors. Changes attributable to BART have been measured against pre-BART and no-BART alternatives in order to place them in perspective. The BIP sought to identify what the impacts were, why they occurred, how complementary actions can assure the fullest possible benefits from BART, and how the lessons learned from the BART experience can increase understanding of the potential impacts of rail rapid transit investments in the Bay Area and other American metropolitan areas.

The major objective of the Land Use and Urban Development Project, conducted from January 1977 to October 1978, was to determine, as accurately as possible, how and to what extent BART influenced the spatial arrangements of people and activities within the San Francisco Bay Area, and whether early expectations of major changes in urban form, increased property values, and central city revitalization have been realized. With this goal in mind, the study of BART's impacts on land use inevitably became a study of urbanization in the Bay Area during the past 15 years. Every aspect of development that BART may have affected or potentially could affect — workplace and residence location decisions, housing construction, retail trade trends, property values and rents, office and commercial space — was examined with the objective of identifying and measuring BART's effects. Both changes in the immediate vicinity of BART stations and possible shifts in development patterns at the regional scale were evaluated to ascertain the extent of BART-induced impacts.

SETTING: THE BAY AREA

Before analyzing BART's land use effects, it is appropriate to describe the context of growth and urbanization into which BART was introduced. As the following sections will indicate, the Bay Area has had and will continue to have significant growth in population, households and housing units, and employment. This growth, however, has not been consistent throughout the Bay Area, and has varied over time. Recent growth has been concentrated in Santa Clara County, southern Alameda County, and central Contra Costa County. Finally, the rate of growth in population and households has diminished during the 1970s, the decade in which BART service began.

The implication of the trends in Bay Area growth is that little open land for residential development existed in the three-county BART service area between 1970 and 1975, with the exception of the Contra Costa corridor and Fremont-Union City.[1] Thus, there was limited opportunity for BART to affect development patterns at a regional scale.

Urbanization

Land use patterns in the San Francisco Bay Area are shaped by natural barriers; namely, the Bay and the coastal hills. North-south corridors of development occur along both sides of the Bay, and an east-west corridor extends from the Berkeley Hills through central Contra Costa County to Walnut Creek and Concord where it intersects a corridor in the San Ramon Valley west of Mt. Diablo. Within the nine-county region, approximately 1,350 square miles of land can accommodate urban development. By 1975, 51 percent of this land was developed for urban uses. San Francisco County has been "built out" since the 1960s, while Alameda County had over two-thirds of its usable land developed in 1975, and Contra Costa County was approximately one-half urbanized by 1975. Between 1970 and 1975, approximately 6,000 acres in Contra Costa and 5,000 acres in Alameda became urbanized.

Bay Area Growth

San Francisco Bay Area population growth has been a continuing phenomenon since World War II. Since 1950, major Bay Area growth has been concentrated in Contra Costa County; Santa Clara, San Mateo, and southern Alameda counties; and to a lesser extent in Marin and Sonoma counties. This reflects the growth of suburban employment centers in the South Bay as well as the growing suburbanization spurred on by rising standards of living and accompanying demand for single family homes.

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[1] The Greater BART Service Area is defined as the three-county (Alameda, Contra Costa and San Francisco) BART District, plus northern San Mateo County. The primary BART Service Area is defined as an immediate "catchment" area in which 80 percent of all BART riders live. It includes five BART corridors: Daly City, Oakland, Richmond, Concord, and Fremont.

Approximately 4.8 million people lived in the nine-county Bay Area in 1975, an increase from 4.6 million in 1970, 3.6 million in 1960, and 2.7 million in 1950. While the annual growth rate declined from 3.5 percent during the 1950-60 period to 2.7 percent from 1960 to 1970, the magnitude of growth was quite similar. Since 1970, both the percentage and magnitude of growth in population have declined significantly. Population growth in the BART service area has been less than that outside the service area, an understandable difference since the BART service area had been developed much earlier and less vacant land remained in 1970.[2]

Since 1970, household size in the Bay Area has been decreasing quite dramatically as in the state and the nation (from 2.90 persons per household in 1970 to 2.65 in 1975), which somewhat diminishes the value of population statistics in analysis of current development patterns. As land consumption, trip generation, and the size of the labor force are related as much if not more to households than they are to population, information on trends in household formation (see Table 1-1) is essential for an understanding of Bay Area development trends.

TABLE 1-1. THREE COUNTY AND BAY AREA HOUSEHOLDS, 1970, 1975, AND 1990 PROJECTION
(Thousands of Households)

				Percent Change	
Area	1970	1975	1990	1970-75	1975-90
Alameda County	365	397	487-509	8.8	22.7-28.2
Contra Costa County	173	202	314-321	16.8	55.4-58.9
San Francisco County	295	299	308-309	1.4	3.0-3.3
Bay Area (9-County)	1,596	1,769	2,343-2,364	10.8	32.4-33.6

Source: U.S. Census and Association of Bay Area Governments (ABAG), **Provisional Series 3 Projections** (Berkeley, California, March 1977).

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[2] It should be remembered that route location decisions for BART were made in the 1950s and attempted to link existing centers.

Households are increasing at a faster rate than population because of greater affluence, less inclination of young and old people to live with parents or children, and late marriage. Thus, while San Francisco population declined by 6 percent between 1970 and 1975, the number of households increased by 1.4 percent.

Analysis of employment trends also contributes to understanding BART's impact on land use and development patterns. Employment in the nine counties of the San Francisco Bay region was approximately 2 million in 1975. In the same year employment in the three BART counties was 1.1 million persons, or 53 percent. Five years before, in 1970, the same three counties accounted for 58 percent of the region's total employment, and in 1960 the share was even greater, 64 percent. This decline in the regional share of employment primarily is attributable to rapid growth in the South Bay — the San Jose metropolitan area — and not to "slow" growth in the BART counties. Between 1965 and 1975 employment in the BART counties and in the BART corridors increased at almost the same rate — 13 percent (see Table 1-2).

THE BART SYSTEM

The Early Years: Planning and Publicity

Planning for BART started in the 1950s. In 1962, following a major publicity campaign, voters in the three-county BART district approved construction of a 71-mile system. They had been told that BART would cost less than $1 billion; that it would provide fast, safe service for long distance commuters working in downtown San Francisco and Oakland; that it would reduce traffic on the Bay Bridge; and that it would carry more than 250,000 patrons on an average weekday in 1975.

To accomplish this, BART planned to use new technology. With an automatic train control system, service frequency during peak commute periods was expected to reach 90 seconds. With a top speed of 80 miles per hour, and one to two miles between stations, BART could achieve an average speed of 45 miles per hour which would be competitive with the automobile. The trains themselves were designed to be lightweight to permit fast acceleration and deceleration. Everyone was promised a seat, even during commute periods; "standing room only" would not happen on the BART system.

Originally, BART was planned at a regional scale to serve all six urbanized counties around the Bay. With withdrawal of Marin, San Mateo, and Santa Clara counties, the BART planners conceived of the current configuration: four rail transit lines radiating from Oakland. The Richmond line and the Fremont line run north-south, serving the East Bay communities. The Concord line extends through a tunnel in the Berkeley Hills to serve the central Contra Costa County communities. The Daly City line connects the East Bay with San Francisco and northern San Mateo County.

TABLE 1-2. EMPLOYMENT TRENDS IN THE SAN FRANCISCO BAY AREA, 1965-1975

County	1965 Employment	1975 Employment	Numerical Change	Percent Change
Alameda	386,500	434,300	47,800	+12.4
Contra Costa	124,300	160,100	35,800	+28.8
Marin	43,800	55,700	11,900	+27.2
Napa	23,300	28,600	5,300	+22.7
San Francisco	464,100	495,400	31,300	+6.7
San Mateo	168,800	225,100	56,300	+33.4
Santa Clara	306,600	517,800	211,200	+68.9
Solano	48,100	52,300	4,200	+8.7
Sonoma	55,500	77,300	21,800	+39.3
Total Region	1,620,900	2,046,600	425,700	+26.3
Special Areas				
BART Service Area	1,013,177	1,143,895	130,718	+12.9
BART Corridor	644,414	727,938	83,524	+13.0
Rest of Region	607,733	902,674	294,941	+48.5

Source: Association of Bay Area Governments

Construction

Under the original schedule BART was to have been completed and open for service in 1969. But negotiations with local governments and coordination with other public improvement programs as well as technical problems with the automatic train control system delayed the beginning of service until September 1972. This delay, coupled with higher than expected rates of inflation, increased BART's construction costs significantly above the original estimate. In the end the total capital cost of building and outfitting BART was $1.6 billion.

The 71-mile system includes 34 stations spaced 0.3 to 0.5 miles apart in downtown San Francisco and Oakland, and two to four miles apart in suburban areas (see Figure 1-1). Parking is provided at 23 stations for a total capacity of 20,000 cars (originally 36,000 spaces were planned). Three types of construction were used. About 20 miles are underground: 13 miles in subway tunnel built by boring or by cut-and-cover operations, three miles in hard-rock tunnel on the Concord line, and four miles in the Transbay Tube beneath the San Francisco Bay. The remaining 51 miles of BART trackways are at grade, on earth embankment, or on an aerial structure. About 85 percent of the BART system lies within, beside, or below the rights of way for other transportation facilities, streets, highways and railroads.

Operation

BART opened in September 1972 with interim service on the Fremont line. Operations began on the Richmond line in January 1973, on the Concord line in May 1973, and on the Daly City line in November 1973. Transbay service linking San Francisco and Oakland was initiated in September 1974. Night service began in 1975, Saturday service in November 1977, and Sunday service in July 1978. In July 1978 the average weekday ridership was 146,000; Saturday patronage totaled 58,600 trips, while Sunday patronage was 32,900. Evening ridership averaged 20,250 trips. Trains operate every 12 minutes on three routes: Concord-Daly City, Fremont-Daly City, and Richmond-Fremont. This results in six-minute train frequencies in downtown San Francisco and downtown Oakland and on the Fremont line where routes converge. Saturday headways are 15 minutes; Sunday and nighttime headways are 20 minutes.

Direct service to downtown San Francisco is provided on the Daly City, Concord, and Fremont lines, but riders from the Richmond line must transfer at MacArthur station to get to San Francisco.

BART fares range from $0.25 to $1.45 depending on the distance traveled. Special reduced fares are offered to the elderly (a 90 percent discount) and handicapped (a 75 percent discount); children under five ride free, and children five to 12 pay 25 percent of normal fare.

BART trains are fast, comfortable, and relatively quiet. Average train speeds, including run time and station stops, are 36 miles per hour, 80 percent of the

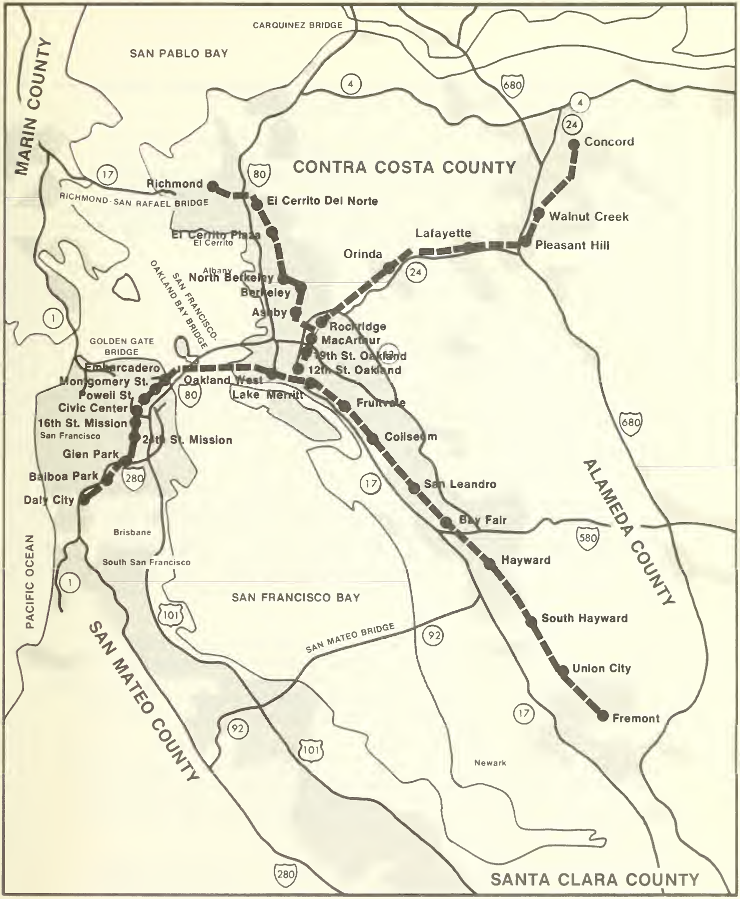

FIGURE 1-1 BART IN THE BAY AREA

LEGEND

Urbanized Area

▬ ▬ ▬ BART Line

● BART Station

North

0 5.5

Scale in Miles

original estimate of 45 miles per hour because the maximum speed in ordinary service is 70 miles per hour, not 80 — the design maximum.

During this start-up period, the system has been plagued with reliability and service problems which, in turn, have affected patronage and BART's image. Although BART has made significant improvements in this area, its operations still are not trouble-free. Brake failures and car malfunctions continue, and the automatic train control system is not completely reliable. These problems stem from BART's use of new technology which, in some cases, was insufficiently tested before being put in service.

BART IMPACTS ON TRAVEL

To what degree has BART affected travel patterns in the Bay Area? There is an extensive network of streets, and highways in the Bay Area, as well as bus and transit systems (see Table 1-3) of which BART is only one part. BART was not designed to serve the entire Bay Area, and analysis of the proportion of all trips that are made on BART in comparison to BART's penetration of the travel market for specific corridors clearly indicated where impacts would be most likely.[3]

In 1975, approximately five million person-trips were made on an average weekday in the greater BART service area. About 30 percent of trips were for work purposes, 7 percent for business, 11 percent for school, 20 percent for shopping, and the remaining 32 percent for miscellaneous purposes. BART usage represented 2.4 percent of these trips, but 5.2 percent of work trips. The typical BART commuter travels 17 miles, 13 miles on BART and four miles to and from the stations. By contrast, work trips by automobile are much shorter, averaging nine miles.[4]

However, most trips in the BART service area are not easily made on BART. In the BART Impact Program, a survey was conducted to measure the proportion of trips that could be made on BART that actually were taken on BART. According to this survey, 11.2 percent of all trips in the three-county plus northern San Mateo County service area could have been on BART, so BART was serving about 21 percent of its potential market.

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[3] For details, Peat, Marwick, Mitchell & Co., **BART's First Five Years: Transportation and Travel Impacts** (Springfield: National Technical Information Service, May 1978). This report summarizes BART's impacts on modal split, bus ridership and service, and highway traffic and congestion and describes the nature of its ridership in detail.

[4] For more on this, see Peat, Marwick, Mitchell & Co., **Travel in the BART Service Area** (Berkeley: Metropolitan Transportation Commission, September 1977).

TABLE 1-3. SAN FRANCISCO BAY AREA TRANSIT SYSTEMS, 1978

Transit System	Service Area	Transit Mode	Weekday Trips
Alameda-Contra Costa Transit District	Alameda and Contra Costa Counties, service to San Francisco	Bus	185,000
Greyhound Bus Lines	Central Contra Costa County to San Francisco	Bus	9,400[a]
Golden Gate Transit District	Sonoma and Marin Counties, service to San Francisco	Bus, Ferry	41,000
San Francisco Municipal Railway	San Francisco City and County	Bus, Trolley and Cablecar	360,000
San Mateo County Transit District	San Mateo and northern Santa Clara Counties, service to San Francisco	Bus	44,000
Southern Pacific Railroad	San Mateo and Santa Clara Counties to San Francisco	Railway	16,000
BART	Alameda, Contra Costa, San Francisco and northern San Mateo Counties	Rail Rapid Transit	145,000

[a] Before BART service.

Source: Metropolitan Transportation Commission

Further analysis showed that BART use varies by corridor of residence and location of workplace. Focusing just on worktrips from the BART primary service area where 80 percent of the riders live to workplaces readily accessible by BART, BART was used for 39.5 percent of all such trips, 48.2 percent of such trips to the San Francisco central business district (CBD), and 43.1 percent of such trips to the Oakland CBD. BART's capture rate for these work trips varied by corridor. For example, from the Concord corridor to the San Francisco CBD, BART served about 55 percent of possible trips, while from the Richmond corridor BART served only 16 percent of all possible trips to San Francisco, the difference presumably a reflection of no direct service from the Richmond line to San Francisco and competition from AC Transit in some areas.

BART usage has been greatest for trips to the San Francisco CBD and to the Oakland CBD, and for trips from the Concord and Daly City (residence) corridors. Therefore, it was expected that BART impacts would be closest to those anticipated in those areas.

BART reduced the number of automobile trips taken in the service area, but it also decreased bus usage. At the same time it also increased mobility and therefore increased the total number of trips taken. For example, among patrons of BART transbay service, 46 percent drove, 46 percent used the bus, and 8 percent did not make the trip prior to BART service.[5]

In summary, BART's effects on areawide travel are relatively small, but it attracts a significant share of travel in several well-defined travel corridors, such as from the Contra Costa corridor to downtown San Francisco.

USERS OF RESULTS: AUDIENCE ORIENTATION

Although this project focused on BART impacts — what has happened — findings and conclusions are presented in a form designed for use by those who will make decisions on:

- Urban development and transportation policies and programs in the Bay Area at the regional scale.
- Urban development and transportation policies and programs directly related to BART at the local scale.
- Maximizing efficiency of BART service (both actions by BART and by the communities served).
- Extensions of BART service and changes in local transit service.

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[5] Peat, Marwick, Mitchell & Co., **BART's First Five Years: Transportation and Travel Impacts Summary and Conclusions** (May 1978), p. 25.

- Construction or extension of rapid transit systems in other metropolitan areas.

This audience includes federal, state, regional, and local decision makers (both planning professionals and lay people), policy analysts, researchers, academics, and others interested in identification of BART's effects (e.g., what aspects of land use and urban development are affected, why the impacts occur, where they occur, who is affected, and how the impacts are determined) and the implications of those effects for the Bay Area and other metropolitan areas.

In addition to indicating the analytical results which may be relevant outside of the Bay Area, the study also provides research design and investigative methods potentially applicable to similar studies elsewhere.

ORGANIZATION OF THE REPORT

The report considers each facet of urbanization separately, following the logic of the impact process. First, the research approach and study methods are summarized (Chapter 2). Then BART's construction impacts are described (Chapter 3), including property acquisition, displacement, and effects on adjacent properties and retail sales. In Chapter 4, BART's effects on accessibility and mobility are summarized to illustrate how BART's transportation service differs from pre-BART and no-BART alternatives. Next is a discussion of BART's effects on location decisions (Chapters 5 and 6), followed by a similar discussion of retail sales, shopping patterns, and property prices and rents — the market effects (Chapter 7), and impacts on regional development patterns (Chapter 8). The findings of programwide case studies of BART's impacts in urban core, urban residential and suburban areas are presented in Chapter 9. The final chapter (10) addresses the conclusions and implications of this research.

RESEARCH STRATEGY: AN OVERVIEW

Broadly stated, the objective of the Land Use and Urban Development Project was to determine how and to what extent BART has influenced the geographic arrangement of people and their space-using activities within the Bay Area. To accomplish this task, the project focused on the way BART has influenced (1) location decision processes; (2) actual movement behavior that results from those decisions and other market forces; and (3) the form, character, and functioning of aggregate spatial groupings that represent the net outcome of these decisions and movement patterns. The attributes of the BART system (such as its transportation service and physical facilities) potentially could affect all facets of urban development with important social and economic consequences. The ultimate concern of the study is to examine the relationships between attributes and consequences.

With this perspective, the study design was organized as a series of discrete investigations of specific impacts, complemented by two interpretive studies intended to depict BART's effects at a community and regional scale. Each study was structured to examine what the impacts were, who is affected (focusing particularly on minorities and the disadvantaged), and why they occur.

THE IMPACT PROCESS: THEORETICAL PERSPECTIVE

The conceptual framework for the project's structure is very simple. The BART system transports people to places where they engage in various activities. If BART provides faster, more convenient, or less costly transportation service than existed prior to its construction, the locations where these activities take place may be expected to change as a result of the system's development. If BART also provides better (or even different) transportation service than would have existed in its place, the new locations for people's activities may be different than they would have been without BART.

Empirical and theoretical models of residential location, employment location, and the interactions between them have been formulated by many researchers in urban economies and geography. The basic theory of residential location, as developed by Alonso, Kain, Brown, and others (see Selected References) posits a tradeoff between housing costs and journey to work costs, which includes the value of travel time as well as out-of-pocket costs. As a consequence, land rent declines with distance from the central business district (CBD). The effect of a transportation improvement (such as BART) is to lower transportation costs for a service area, thus encouraging consumption of more land and housing further from the CBD. On the other hand, if the improvement only affects one corridor, residential land prices and density will increase relative to other corridors.

Theories of employment location, such as central place models by Christaller, Berry, and Garrison, suggest that a reduced transportation cost for a specific employment center will tend to increase production or employment at that point.

Interaction models, including gravity models (Lowry, for example), attempt to deal with the relationship of workplace and residence location without assuming fixed central locations for all employment as do the residential models, or fixed residential locations as do the employment location models. The interaction models approximate actual development closest by allocating exogenously determined basic or export-based jobs to zones, and then allocating residential development (based on assumptions of minimum commute time) by a gravity model which also assigns population-serving or non-basic employment as a proportion of the first-round residential allocations, subject, of course, to land availability. The third or latest generation models have incorporated travel mode choice into the allocation algorithm.

While there are several problems in attempting to apply any of the urban theoretical models to an understanding of BART's possible effects on development patterns, they were important in early expectations of BART's effects. Thus, the **1962 Composite Report** expectations that BART would "maintain and encourage profitable concentrations of business and industry" and preserve and increase property values in the central cities, regional subcenters and outlying areas" were based on such urban theory.[1]

There appear to be several reasons why BART's impacts on development patterns do not seem to fit theoretical expectations, and these may be more related to problems with the models rather than characteristics of BART. Transportation models tend to ignore other strong influences on development besides economic theory, including the governmental intervention effects on the urbanization process. Local land use and zoning controls and environmental review procedures in the Bay Area have increased greatly since the 1950s and early 1960s when BART projections were made and today are major determinants of urban development. Other non-transportation determinants of land use include federal tax policy, ethnic discrimination, differing levels of public services in various communities, and Bay Area topographical constraints. Neighborhood and community political influence on decision makers also has become more important over the past 10-15 years, and the sum of these factors diminish the ability of such theoretical models to project land use changes correctly.

Even considering the non-transportation effects on land use, it is very difficult to predict the net effect of a change in commuting costs to a particular employment location with the theoretical models. The problem in determining the net effect of a commute time and cost change on density is that the effects on central area workers' residential locations and on population serving employment that follows those residents conflicts with the effect on central area employment.

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[1] Parsons, Brinckerhoff, Tudor, Bechtel, **Composite Report — Bay Area Rapid Transit** (May 1962), p. 76.

For example, while a commuting cost reduction tends to decrease density because workers consume more land and housing farther away and population serving employment will also decentralize to follow the residents, the same cost reduction tends to raise employment concentrations at the center and, therefore, the number of workers who must live within commuting range. Another problem with use of theoretical models for assessing the effects of BART is that models are generally not dynamic. Real estate investments are relatively long-term fixed assets, and therefore changes in patterns take many years to develop.

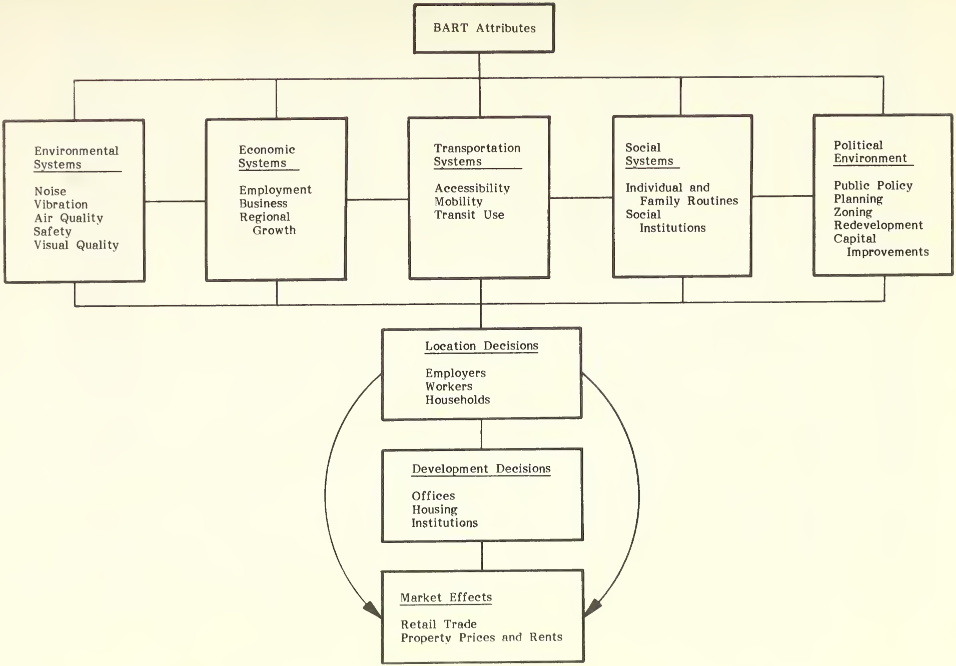
To provide a framework for research, the BART Impact Program defined an impact process as the first step in identifying cause-effect relationships and organizing subsequent studies on specific subjects. The impact process illustrates a sequence of events, linking them to specific attributes of BART. Of relevance to the Land Use and Urban Development Project are four of the five attributes defined by the BART Impact Program: organization, planning and publicity; the construction process; transportation service; and facilities and operations. The fifth, capital and operating expenditures, was analyzed at a regional scale in the Economics and Finance Project, and has no apparent land use and urban development impacts.

The BART impact process began with early planning and system design studies in the 1950s; the first major milestone was in 1962 when the $790 million bond financing plan to build the system was approved by the voters in the three-county BART District. Then, final decisions were made on route and station locations, and the physical alignment and operating characteristics of the system were established. With construction and the opening of service, further changes in the environment and the transportation system occurred; the final links in the process include perceptions of BART and its impacts — both actual and expected — and actions taken in response to them. Figure 2-1 illustrates this process; the hypothesized effects of each BART attribute are described in the following paragraphs.

Organization, Planning and Publicity. A newly created transit district with powers, funds, and personnel potentially can affect the policies and programs of other public agencies. Its planning and publicity can raise expectations long before service actually begins. Local plans and zoning may be revised to reflect perceived opportunities of transit and related development and capital improvement programs and redevelopment projects initiated or expanded to accommodate potential demand. As a result, speculation in station area properties may occur, and developers may design and locate projects in anticipation of a "BART market."

The Construction Process. This attribute includes the acquisition of land and property to accommodate the facilities needed for a fixed rail rapid transit system — trackway, stations, parking lots, and maintenance/storage yards. Households and businesses may be displaced as a consequence, and a number of direct

FIGURE 2-1. THE PROCESS OF BART'S IMPACTS ON PEOPLE'S ACTIVITIES



environmental effects, such as noise, dirt, and traffic disruption, also may occur. Indirectly, these environmental effects may change patterns of shopping, entertainment or business life and be reflected in temporary declines in property prices and rents.

The Transportation Service. This attribute establishes the specific parameters of the service offered (speed, frequency, comfort, cost, and coverage) and its relationship to other modes of travel, notably ease of transfer to a local bus system and parking availability. The transportation service directly affects travel behavior. Workplace and residential location decisions, shopping patterns, retail sales trends, property prices and rents, office and commercial space, station area land use, and housing construction also may be affected.

Facilities and Operations. The physical structures of the system, such as stations and trackways, and actual train operations are represented by this attribute. The direct impacts are on the environment; indirectly, household and business location decisions could be affected, and property prices and rents may decline because of nuisances such as train noise and vibration.

In examining the impacts of each of these attributes, the project also sought answers to the following questions on distributional effects:

- Have BART's organization, planning and publicity and its transportation service maintained and encouraged business and industry concentrations, and improved economic efficiency by reducing urban sprawl? Or has the system contributed to urban sprawl by inducing low density residential development in outlying areas?
- Looking at the property price and rent impacts of all attributes, is there an induced "net value increase" for the Bay Area or just a shift in value from unserved areas to those served by BART?
- Are people in different social and income groups affected differently, and how significant are these differences? Does BART induce upper middle class whites to leave the central cities faster? Do low income workers find improved employment, higher income, and residences nearer their jobs? Do elderly, young, and handicapped people take better advantage of services they need or desire?

The No-BART Alternative

A critical element in the study design of the BART Impact Program was the definition of the No-BART Alternative (NBA), the regional transportation system judged most likely to have evolved by 1976 in the absence of BART. Since the program defined an impact as the difference between what actually occurred and what would have resulted without BART, the definition of the NBA was an important factor in determining BART's impacts. Based on an analysis of the political and economic decision history of the Bay Area and the professional judgment of those involved in the Program, it was decided that no significant changes to the area's existing freeway and bridge system would have occurred without BART. It is likely, however, that increasing travel demand and traffic congestion after 1976 would have required additions to the capacity of the transportation system.[2]

RESEARCH STRATEGY AND METHODS

The research approach used in the project was set forth in the **Study Design**.[3] First, for each type of impact from two to eight research hypotheses were formulated, stating what effect BART might have had. These are stated in a summary fashion in Figure 2-2.[4] Then an analysis method was defined and data collected to test the validity of the research hypothesis. Careful attention was given to obtaining statistically significant and valid results, distinguishing BART-caused changes from events that would have occurred had BART not been built. To accomplish this, surveys (stratified sample and key informant), studies of physical conditions, statistical analysis of primary and secondary data, and policy-oriented case studies were employed. The combined data produced a picture of the shifts in property values and location of activities, and the social consequences flowing from the decision to build BART.

The heart of the assignment was to obtain accurate measures of change, isolate those changes attributable to BART, and further separate those resulting from BART's actual impacts from those attributable to BART's expected impacts. Expected impacts that have not occurred may yet be observed as BART reaches full service, but some expectations were unrealistic and will never result from a rail transit investment. The ability to identify each change and its cause will determine the study's value as a tool for making the best use of the system, predicting the effects of changes in operation or route extensions, and for evaluating the suitability of similar rapid transit systems to serve other metropolitan areas.

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[2] For details, see Appendix B of the BART Impact Program final report, **BART in the Bay Area** (Berkeley: Metropolitan Transportation Commission, forthcoming).

[3] John Blayney Associates/David M. Dornbusch & Company, Inc., **Study Design and Project Implementation Plan** (Berkeley: Metropolitan Transportation Commission, March 1977).

[4] All told, 76 research hypotheses were examined during the course of the study. For details, the individual working papers listed at the end of this report should be consulted.

FIGURE 2-2. A FRAMEWORK FOR ASSESSING BART'S IMPACTS ON LAND USE AND URBAN DEVELOPMENT[1] (RESEARCH HYPOTHESES)

THIS ATTRIBUTE	THROUGH ITS EFFECTS ON THESE CONDITIONS	INFLUENCES ON THE LOCATION OF			AND AS MEDIATED THROUGH THE REAL ESTATE MARKET	PRODUCES THESE SPATIAL DISTRIBUTIONS	WITH THESE CONSEQUENCES
		ACTIVITIES,	ESTABLISHMENTS	AND STRUCTURES,			
Transportation Service	Travel conditions (speed, comfort, safety, cost, etc.); levels and patterns of ridership; highway travel; other transit use; local public policy; land use and traffic planning; regional growth and economic activity; individual and family routines; social institutions		**WE 3, 4, 5.** Households	**WE 5.** Housing - New Construction **WE 5, 7.** Housing - Redevelopment	**WE 13.** Increase in property values and rents near stations **WE 13.** Increase in total regional property values **WE 13.** Speculative acquisition of property near stations **WE 14.** Speculative withholding of property near stations	Population and residential development: **WE 7.** Shift to BART service area and station areas **WE 7.** Intensive residential development near stations **WE 5, 7.** Extensive residential development beyond outlying stations	Replacement of low-income population and business by upper-income population and offices in station areas
		WE 3, 4. Working	**WE 8.** All kinds of establishments that employ people			**WE 7.** Shift of employment to BART service area and station areas	Movement out of cities by middle-income whites and middle-income minorities
		WE 3, 4, 9. Shopping for retail goods	**WE 9.** Retail outlets			**WE 9.** Shift of retail sales to BART station areas	
		WE 3, 4, 9. Obtaining consumer services	**WE 9.** Other population-serving establishments				
			WE 8. Non-consumer serving establishments				
			WE 6. New office activity	**WE 6.** Office Space - Redevelopment **WE 6.** Office Buildings - New		**WE 6.** Intensive office development near stations	
Facilities and Operations	The physical environment (noise, vibration, views, air quality, etc.)		**WE 5.** Households **WE 8.** Establishments seeking visual exposure	**WE 5.** Housing	**WE 14.** Decrease in property values along surface and elevated trackage		
Organization, Planning and Publicity	The attitudes of local officials, builders, developers, businessmen, home buyers, etc.			**WE 5, 6.** Housing, office buildings			
Resource Utilization (Land)			**WE 11.** Displacement of households and other establishments	**WE 11.** Demolition of pre-existing structures			
			WE 11. Re-occupancy of air rights or surplus land	**WE 11.** Construction on air rights or surplus land			
Construction Process	Travel conditions and the physical environment during the construction period; capital improvement programs	**WE 12.** Shopping for retail goods and obtaining services		**WE 12.** Elimination or deferral of maintenance and construction	**WE 13.** Temporary decrease in property values and rentals near construction		

1. Numbers on this chart refer to the individual work elements of the Land Use and Urban Development Project in which the subjects were addressed.

Critical to the research strategy was the use of triangulation to identify and isolate BART's impacts. Sometimes two or even three different analysis methods were employed to provide several perspectives on a given phenomenon and test for a BART effect. This overlapping methodology, redundant and eclectic in technique, ensured that no BART effect would be overlooked. Reliance on a single set of theories or one formal model could have obscured important facets of BART's impacts on urban development.

In the project, a number of data collection techniques were used to obtain information on the activities BART conceivably might have affected: station area land use, construction and rehabilitation, shopping and retail sales activity, property values and rents, and local land use policy. Sometimes data collected were used to analyze a specific BART impact, while in other cases, notably the surveys, a range of information was obtained about many different types of impacts. The overriding objective of the data collection effort was to obtain information for the specific hypothesis tests. Specific data sources used in the project, their strengths and limitations, are described in the following section.

System User Characteristics

BART's monthly patronage reports and the 1976 BART Passenger Profile Survey conducted by MTC were the main sources of information on ridership and the socioeconomic characteristics of BART patrons. With BART's on-line reporting system, ridership data can be obtained at various levels of aggregation, depending on the researcher's needs. For any given station or line segment, patronage volumes are available for any time period, from hourly totals to daily peak or off-peak, or monthly averages.

Accessibility and Mobility[5]

The accessibility and mobility analyses conducted in the project were intended to provide a starting point for the specific studies of how BART might have affected land use and urban development, the assumption being that BART's greatest land use impacts would be in the areas where BART offered the greatest gains in accessibility and mobility. Using a regional transportation modelling system maintained by MTC, comparisons between BART and a No-BART alternative were made. For a variety of trips and trip combinations, differences in travel time and cost were calculated, and the results mapped on a zonal basis. In retrospect, this approach to analyzing accessibility and mobility impacts proved limiting, for it neglected other features of travel behavior that often dictate a choice of mode: convenience, ease of transfer, safety, and other sometimes

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5. John Blayney Associates/David M. Dornbusch & Company, Inc., **Accessibility Mapping** (Berkeley: Metropolitan Transportation Commission, March 1977) includes maps and tables of accessibility and mobility measures and maps of auto access times to selected BART stations.

unquantifiable aspects of a trip. A better understanding of how BART affects overall mobility, either on a corridor scale or systemwide, is needed in order to relate these impacts to the indirect effects on land use and urban development. The transportation system as a whole needs to be examined, and travel behavior should be carefully monitored to see what changes BART induces.

Station Area Land Use[6]

Current land use was obtained from 1977 aerial photographs, street level photographs of the station areas, and land use maps maintained by local planning departments. Changes in station area land use were identified by comparing the 1977 aerial photographs with similar photographs taken in 1975 and 1965.

For the study of speculation, conditional use permits and homeowners' exemption records were assembled, and differences analyzed in relation to proximity to a BART station.

New Construction and Rehabilitation[7]

The principal source of information on station area construction and rehabilitation activity is the building permit which shows the address of the project, the construction value, the owner/applicant, the number of units proposed or amount of commercial space, and other pertinent data. Monthly construction reports filed by all cities with the Bureau of the Census show total permit activity authorized and list pertinent information on all major projects ($100,000 or more in value). Some jurisdictions maintain records of construction activity for individual planning areas, but most do not. Consequently, information on individual projects was gathered only in selected station areas.

Travel Behavior, Shopping, and Location Decisions

Four major surveys were conducted to obtain information on travel behavior, shopping patterns, and workplace and residential location decisions. Three of these were undertaken in the Land Use and Urban Development Project, while the fourth, the Workplace Survey, was designed to meet the needs of the Transportation Systems and Travel Behavior Project. The pertinent characteristics of each survey are as follows:

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[6] John Blayney Associates/David M. Dornbusch & Company, Inc., **Station Area Land Use** (Berkeley: Metropolitan Transportation Commission, November 1977) summarizes data collection and classification methods used and data sources for the analysis of land use changes.

[7] John Blayney Associates/David M. Dornbusch & Company, Inc., **Study of the Office Construction Industry** (Berkeley: Metropolitan Transportation Commission, August 1977) includes a complete description of construction data available from building departments in all communities served by BART.

- **MTC Workplace Survey.** This was conducted in 1977 among workers employed within a set of 88 traffic analysis zones (two to four census tracts in size) readily accessible by BART. This survey had 8,391 responses, based on a random sampling proportion of one-in-60 of the workers in the area surveyed. It focused on mode choice, travel time, work and residence location, and demographic characteristics.

- **Households Location Survey.** A study of 315 households and their reasons for moves into Walnut Creek, into the Mission District, and out of East Oakland (see the **Study of Households' Location Decisions**).[8]

- **Downtown Workers Survey.** A study of 314 workers who had switched or started work in downtown San Francisco or Oakland during the past three years (see the **Study of Workers' Location Decisions**).[9] This survey involved a two-stage interviewing process — first an intercept interview, and then a follow-up telephone interview.

- **Retail Shoppers Survey.** A study of 499 shoppers in six commercial areas, probing their current shopping trips, historic and current shopping patterns, and demographic characteristics (see **Study of Retail Sales and Services**.)[10] Respondents were screened to eliminate people who had not lived in the BART service area for at least three years and to obtain an equal number of BART riders and non-riders.

To permit cross-survey comparisons, MTC established a data policy for the BART Impact Program, prescribing a common format for all survey research.

Key Informant Interviewing

For the project, over 200 interviews were conducted with developers, employers, public officials, bankers and others knowledgeable about BART and its effects on land use and urban development. The interviews were intended to solicit information not readily available from published reports and newsclippings on the decision making process, the motivation behind key factors, and the cause of changes in land use, property prices, tenure, ownership, shopping patterns, and location decisions. In addition, key informant interview notes obtained from other projects, notably the Economics and Finance and Environment projects, were critically reviewed, and in some instances follow-up interviews were conducted to clarify ambiguous points or to cover related topics of interest. Questionnaires used in key informant interviewing and the names of those interviewed are included in the Appendix of each working paper (see Project Documentation at the end of this report).

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[8] John Blayney Associates/David M. Dornbusch & Company, Inc., **Study of Households' Location Decisions** (Berkeley: Metropolitan Transportation Commission, February 1978).

[9] John Blayney Associates/David M. Dornbusch & Company, Inc., **Study of Workers' Location Decisions** (Berkeley: Metropolitan Transportation Commission, November 1977).

[10] John Blayney Associates/David M. Dornbusch & Company, Inc., **Study of Retail Sales and Services** (Berkeley: Metropolitan Transportation Commission, April 1978).

Real Estate Market and Retail Sales[11]

For the study of BART's effects on property prices and rents and retail sales, time series data were collected. In the property values study, these included transaction prices and rent levels for buildings located in station areas. For the retail sales study, sales tax data were obtained from the State Board of Equalization for a sample of stores in 17 shopping areas.

Local Land Use Policies[12]

To complete the information base, all relevant planning and zoning studies, capital improvement programs, and redevelopment project reports were obtained. Often these contributed a great deal to our understanding of why development occurred in one station area but not in another, and the relative importance of local land use policies in interpreting urbanization patterns. Most of the information that could be mapped was organized in an atlas format to facilitate analysis and interpretation. The Station Area Land Use Atlas also was designed to be easily updated as further information became available, and thus would be an integral part of a long-term monitoring program.

LIMITATIONS

The findings and conclusions of the Land Use and Urban Development Project should be viewed with the following caveats in mind. First, BART was approved and built during the 1960s — a period of vigorous growth and economic development in the Bay Area and elsewhere in the nation — so BART's effects cannot always be isolated easily from other influences affecting travel patterns, central city office construction or suburbanization — to cite three of the problem areas. Further, BART was planned as an independent institution without full coordination among existing transportation agencies or with local land use policy. Thus, there was no assurance that the planning assumptions of BART's designers would be implemented by local governments.

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[11] John Blayney Associates/David M. Dornbusch & Company, Inc., **Study of Property Prices and Rents** (Berkeley: Metropolitan Transportation Commission, July 1978); John Blayney Associates/David M. Dornbusch & Company, Inc., **Study of Retail Sales and Services** (Berkeley: Metropolitan Transportation Commission, July 1978).

[12] These are documented in the **Station Area Land Use** working paper.

BART began interim service in 1972 and transbay service linking Oakland and San Francisco in 1974. Night service has operated since 1976, and Saturday service started in November 1977. Full, seven-day service began in July 1978. During this start-up period the system was plagued with train breakdowns and service problems which, in turn, have affected patronage and BART's image. Although BART has made significant improvements in reliability, its operations still are not trouble free. Consequently, many of BART's potential effects may have been constrained by this period of interim service.

Several other limitations affected the analysis of BART's effects. The first concerns data availability. Obviously not all quantitative data that were desired were readily available. Some types of data simply did not exist in given jurisdictions, or existed but not in readily usable form. Potential violations of confidentiality also imposed restrictions on data use.

The computer-coded transportation network on which the accessibility mapping and mobility analyses were based was designed for regional transportation planning in the nine-county Bay Area, and was not specifically created for the BART Impact Program. Thus, assumptions about travel times from the zone centroid to a BART station, average waiting times, transfer times and run times, as well as estimates of zone to zone trips may be accurate only within a range of 10 to 20 percent. Because the gains attributable to BART were small and quite sensitive to changes in these assumptions, the "savings" should be interpreted with a potential error factor of at least 10 percent in mind.

An inherent limitation of the key informant interview technique is that the method necessarily relies on the informant's memory and personal biases. The initial "selling" of BART before the 1962 referendum and subsequent public relations efforts may have generated many preconceptions about what effects the system might have. Another limitation of key informant interviews is that often informants cannot articulate the relative importance of the many factors which entered into a decision.

In several case study areas, redevelopment projects that occurred concurrently with BART construction made it difficult to attribute which effects resulted from BART, and which from redevelopment. Changes in gasoline prices and racial changes in neighborhoods also occurred concurrently with BART development and initiation of service, and the differential impacts of these effects can be difficult to separate.

Finally, the study areas that were selected often have unique features, and the reader should be cautious about applying these findings to other locations. For example, the topography of the Bay Area limits development to linear corridors which, in turn, dictates the proportion of the population that potentially can be served by a rail rapid transit system.

3. CONSTRUCTION IMPACTS

INTRODUCTION

The process of building BART involved land acquisition and displacement of businesses and households and, during the construction phase, impacts on real property and retail sales. Studies of BART's land consumption focused mainly on land acquisition, the relocation process, and development on surplus properties BART acquired and subsequently sold. However, BART's construction impacts were not confined to property acquisition and disposition. In downtown station areas, the disruption to street and pedestrian traffic which prevailed for as long as five years was examined. The investigation also attempted to determine whether the construction activities had caused physical damage to nearby property or had discouraged new construction or building maintenance in the vicinity.[1]

METHODOLOGY

The BART Real Estate Department provided detailed information on land acquisition, relocation assistance, and development on surplus properties. To facilitate analysis and documentation, a computerized data file was created containing information on (1) parcels acquired by BART and the California Department of Transportation (CALTRANS), (2) BART's relocation assistance, and (3) the 1970 socioeconomic characteristics of the census tracts traversed by BART. Interviews with a small sample of displaced businesses and households were conducted to determine their views of the relocation process. Others knowledgeable about BART's real estate activities also were surveyed to learn about acquisition and disposition policies and development on surplus properties.

Key informant interviews provided much of the information used to assess the impacts of BART's construction on retail sales and real property. Retailers' impressions of BART construction's effects on their sales were taken from 29 interviews performed for the study of retail sales and services and the study of the office construction industry; property owners' views of the effects on maintenance, rehabilitation and new construction were gained from nine interviews conducted for the study of the housing industry.

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1. For a complete, technical discussion of BART's construction impacts, see John Blayney Associates/David M. Dornbusch & Co., Inc., **BART's Consumption of Land and Property** (Berkeley: Metropolitan Transportation Commission, March 1978); and John Blayney Associates/David M. Dornbusch & Co., Inc., **Study of BART's Construction Impacts** (Berkeley: Metropolitan Transportation Commission, April 1978).

Supplementary evidence was obtained from several sources. Contemporary newspaper accounts, BART's complaint files, and descriptions of lawsuits were reviewed. Sales tax data for 286 stores in downtown San Francisco, Oakland, and Berkeley from 1970 through 1976 were analyzed by comparing sales levels during construction with sales after construction. Differences were also studied by distance to BART. Finally, building permit data gathered for the study of the office construction industry were reviewed for evidence of declines in construction activity within 150 feet of BART, coinciding with BART construction. Permits for maintenance and rehabilitation were similarly examined.

BART'S CONSUMPTION OF LAND AND PROPERTY

To accommodate the lines, stations, and yards, BART acquired and uses close to 1,100 acres of land. This represents approximately 26 square feet per passenger-mile for the 1977 average daily ridership. By contrast, 53 square feet of land was required per passenger mile of travel by auto, bus and truck in the three county BART District in 1977. Because so much of the system was located within or adjacent to existing freeway and railroad rights of way, displacement of households and businesses was relatively small, and in fact, over 60 percent of the land BART bought formerly was undeveloped or used for transportation purposes (625 acres). Only 271 acres, 26 percent of the land taken, was in residential use. The remaining land was in commercial and industrial use. The principal land use of parcels acquired is shown in Table 3-1.

TABLE 3-1. PRINCIPAL LAND USE OF PARCELS ACQUIRED

	Number of Parcels*	Percent of Total Parcels Acquired	Percent of Total Acreage Acquired
Open Space	707	21.6	42.5
Single Family Residence	1,475	45.0	21.4
Multi-Family Residence	465	14.2	5.4
Commercial	221	6.7	5.0
Industrial	116	3.5	4.1
Mixed	129	3.9	2.2
Other	154	4.7	6.5
Railroad	9	0.3	12.9
(Missing data)	(200)		
Total		100.0	100.0

*For analysis purposes, some parcels were combined.

Source: BART Real Estate Department, California Department of Transportation, District 4 Office.

BART's land purchases began in 1964 and, by the end of 1969, more than 95 percent of the 3,750 parcels needed for the system had been acquired (see Table 3-2). Over half the purchases (2,011 parcels) occurred during a two year period (1965-66). Of the total, 58 percent involved a complete taking of land and improvements, while the remainder included various combinations of partial takes and easements. In many cases, when BART had to acquire a lot with a single family home or small apartment building, it was able to sell the structure separately to someone willing to relocate it, thus minimizing demolitions. By this process alone, nearly 600 buildings were moved; some even were barged to Stockton in the Central Valley.

TABLE 3-2. DISTRIBUTION OF LAND PURCHASES FOR BART RIGHT OF WAY BY YEAR

	Number of Parcels*	Percent of Total Parcels Acquired
1964 or earlier	341	11.1
1965	1,221	38.5
1966	790	25.0
1967	456	14.4
1968 or later	348	11.0
(Missing data)	(320)	
Total		100.0

*For analysis purposes, some parcels were combined.

Source: BART Real Estate Department, California Department of Transportation, District 4 Office.

About 20 percent of BART's total acquisition, 200 acres, was required for parking; the balance was for the stations, yards and right of way. The right of way take itself rarely exceeded 75 feet in width. By contrast, an eight-lane freeway requires at least a 170-foot-wide right of way.

Residential and Business Displacement

A total of 3,000 housing units were removed for construction of BART's station and lines; this displaced 7-8,000 people (0.8 percent of the primary service area population) including those affected by the additional freeway widths necessary to accommodate BART in a widened median. BART acquisition of housing by area, type, and value is shown in Table 3-3. While this displacement may seem large in absolute terms, BART's impacts in comparison with other transportation projects were relatively small, given the extent of the system. For example, the three and one-half mile Grove Shafter freeway in Oakland displaced 3,000 households and numerous small businesses, all but 100 of which would have been displaced if BART had not been in the median.

TABLE 3-3. BART ACQUISITION OF HOUSING BY AREA, TYPE, AND VALUE

Area	Single Family Units Number	Single Family Units Average Value*	Multi-Family Units
Urban			
San Francisco-Daly City	260	$19,700	24
Oakland	180	17,300	740
Berkeley	141	17,900	376
Albany-El Cerrito	146	18,000	157
Richmond	111	13,400	59
Suburban			
San Leandro-Fremont	202	$14,000	24
Orinda-Concord	335	24,000	189
Total	1,375	$18,500	1,569

*Value of unit at time of purchase, primarily 1965-1967.

Source: BART Real Estate Department, California Department of Transportation, District 4 Office.

While comparable data on the total number of businesses displaced are not readily available from the Real Estate Department's records, the number of parcels classified as commercial or industrial use may be taken as a proxy for the number of establishments. Using this assumption BART displaced 450-500 businesses.

Relocation of Households and Firms

Because BART did not provide relocation assistance until 1966, after half of the parcels already had been acquired, records on the relocation process are incomplete. Overall, 441 residential relocation payments (for the most part, $50 per bedroom up to $250) were made to a total of 1,281 persons. Moving expenses up to $3,000 also were paid to 257 businesses.

The BART Real Estate Department always followed the most liberal state and federal relocation guidelines, including the most recent regulations of the 1970 federal Uniform Relocation Assistance and Real Property Acquisition Policies Act. However, BART's relocation program largely was unaffected by the 1970 Act (which significantly increased payments) because close to 90 percent of the relocation had been completed under prior regulations.

A majority of the sample of 134 households receiving relocation payments, 55 percent, were able to find housing within the same community, and another 19 percent remained within the same neighborhood. Displaced businesses had a similar experience if analysis of a sample of 69 businesses and interviews with representatives of 14 firms selected from the relocation files are any indication. Among those surveyed, three-quarters said that they were able to relocate locally. This experience may not be indicative of all relocatees because payments were available when land was being acquired in some corridors but not available during the acquisition phase in other corridors.

SURPLUS PROPERTIES

BART had to purchase a certain amount of land that was not actually needed for its right of way, but the quantity was small. In fact, only 8 percent of the total land acquired subsequently was classified as surplus (86 acres). Until the spring of 1977, the Real Estate Department had a policy of retaining surplus properties in designated "impact areas", located mainly around stations but also in downtown Oakland, where a significant appreciation in value was expected. On March 24, 1977 the Board of Directors decided to dispose of all remaining surplus lands because the District was not in the real estate business.

As of September 30, 1977, 526 parcels comprising 46.2 acres had been sold, leaving 40 acres of surplus land. A survey of development on parcels over one-half acre in size indicated that about one-third of the land now is in residential use, and 106 housing units have been built on or are proposed for BART surplus land (see Table 3-4).

In downtown Oakland BART has leased most of its surplus land for interim uses such as parking (305 spaces) pending specific development proposals. Most leases have a five-year term with renewal options, except for a restaurant which obtained a 55-year tenancy. (Total lease income from all surplus properties was just under $100,000 in 1977.)

TABLE 3-4. SUMMARY OF DEVELOPMENT ACTIVITY ON BART SURPLUS LAND (Sold Parcels Greater Than One-Half Acre)

Existing/Proposed Use	Sites	Structures	Acres	Percent of Total
Public Open Space	5	—	9.1	22.1
Single Family Residence	8	15	13.2	32.1
Multi-Family Residence	1	3*	0.7	1.7
Government Facility	5	3	11.2	27.3
Adjacent Owner/Unknown	7	—	6.9	16.8
Total			41.1	100.0

*Total of 88 Residential Units

Source: John Blayney Associates, BART Real Estate Department

EFFECTS ON RETAIL SALES

Cut-and-cover construction, used for subway stations in the central cities, was the most disruptive form of BART construction. Downtown San Francisco was particularly affected. Station construction on Market Street lasted about five years, with the station-shell construction (the period of greatest disruption) lasting about three years. During this period, many facets of life on Market Street were directly affected. For example: Busses, streetcars, and trolleys were repeatedly rerouted, bus stops were temporarily eliminated or moved, private automobile traffic was banned from various segments of Market Street, construction equipment and debris created obstacles for pedestrians, barricade-like retaining walls were constructed in front of some buildings, sidewalks were partially narrowed, and in places torn up and replaced by ramps. Taken together, these factors tended to confuse pedestrians and users of public transit, impair the accessibility to businesses, reduce the visibility of storefronts and detract from the aesthetics of the immediate area.

Just as most of the station work was being completed in downtown San Francisco, the Market Street beautification project was initiated. The project entailed reconstruction of sidewalks along a two-mile stretch of Market Street. The beautification lasted about five years, thus effectively doubling the span of time when activity on Market Street was disrupted. Because the beautification effort was prompted by plans for BART, it must be viewed as an extension of BART's direct construction impacts.

Fifteen merchants from eight areas representative of impacted neighborhoods throughout the three-county district were asked whether BART's construction had affected their retail sales. About one-half noted declines during the period of BART's construction, and of these, half declared that BART was the cause. Twelve of the 13 non-merchants interviewed also noticed local declines in sales during construction. With one exception (Richmond), declines were observed only in the cut-and-cover construction areas; no suburban store reported a decline in sales during BART construction. In some cases, however, sales had been falling before BART construction began, and in Oakland and Richmond redevelopment was thought to be a major cause of the decline.

Newspaper articles during the construction period document the protests of Market Street merchants, mostly owners of small stores. Their complaints centered on sales losses allegedly caused by impaired access and reduced pedestrian traffic resulting from BART's construction activities. At the same time, a number of articles claimed that BART's construction impacts were not as severe as had been expected.

At least six lawsuits filed or threatened against BART claimed that construction activities had detrimentally affected business. All have been settled without payment of damages by BART.[2]

Sales tax data sampled for retail stores in the downtowns of San Francisco, Oakland, and Berkeley did not clearly support a hypothesis that receipts of stores near BART declined (in constant, 1967 dollars) during the construction period, while those of stores located farther from the construction activities did not. In all three areas large stores within 400 feet of a BART station were found to have experienced declines during BART construction, but the more distant stores' sales also fell. Although the construction period declines of the near-BART stores were greater than those of the other stores, their post-construction declines were also greater. Because comparable data prior to 1970 are unavailable, one is unable to establish whether the data indicate overall (1) that the near-BART stores were less prosperous than the others even before BART construction began, or (2) that BART's construction depressed the business of the near-BART stores, and they had not fully recovered from the decline by 1976.[3]

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[2] In the cases which were resolved by judicial proceedings, the court found that BART was not liable because such damages are noncompensable when attributable to the reasonable actions of a public agency causing temporary inconvenience or disturbance to private individuals or businesses.

[3] Another possible explanation is that the construction discouraged shoppers from patronizing the entire downtown area, and the habits of the shoppers did not revert upon completion of construction.

Within the City of Berkeley, retail sales data showed strong evidence for a decline and lack of recovery related to BART construction in the Ashby station area. A 1971 report by the City's planning department corroborated the evidence, stating that streets torn up because of BART construction had exerted a negative effect on business in the area.

Because BART's most disruptive construction activities tended to be concentrated in the central cities, retail sales in areas with large minority and low income populations tended to be affected. The two areas presenting the strongest evidence of impact, the Mission District (according to key informant interviews) and the Ashby station area (according to sales data and other sources), are largely populated by Spanish heritage and black populations, respectively.

EFFECTS ON NEARBY PROPERTIES

BART's construction activities did not impede property maintenance or rehabilitation near the line. Nor, except possibly in Oakland, was new construction slowed. All nine key informants (employers and builders in the housing industry) responding to the question stated that BART's construction had no impact on decisions to maintain, rehabilitate, or begin new construction.

Building permits for additions and alterations to offices within 150 feet of BART evidenced no declines during BART construction anywhere along the line. Permits for new office construction, however, were found to decline temporarily in the downtown Oakland-West Oakland corridor. At the same time, permits for new construction in the City as a whole did not have this pattern. The temporary drop in new office construction activity near BART may be explained by BART's construction, or it may be due to redevelopment (property acquisition and clearance) begun in the 12th Street station area during the same period.

Evidence of property damage incurred by BART's construction is found in claims filed against BART contractors, in lawsuits undertaken against BART, and in BART's own complaint files.

A total of 3,332 damage claims have been filed against BART contractors, who in turn were insured by BART. Most of the claims were filed by utilities, although some were filed by one contractor against another. A smaller number were filed by individuals for damages to their property or person.

About 25 lawsuits involving elements of structural damage caused by construction activities have been filed against BART. Generally the types of damage cited were wall and ceiling cracks and structural harm caused by BART excavations. The only case which has not yet been settled in favor of the defendant, **Holtz v. Superior Court** (3 Cal. 3d 296), established that unlike private parties, BART as a public agency was liable for damage to adjoining properties that was caused by the agency's excavations, even though no negligence was involved. The case was appealed to the California Supreme Court (17 Cal. 3d 648), but the verdict was not changed.

Throughout the construction period many householders and businesses complained to BART about damages from nearby construction activities. These were dealt with promptly and personally. BART also received complaints about many unrelated construction activities, indicating that people often attributed all such activities during that period to BART. A perusal of the complaint files shows that in several instances the contractors made minor repairs in the interest of good community relationships, even though the problem clearly was not caused by BART construction.

CONCLUSIONS AND IMPLICATIONS

Overall, BART's consumption of land and property for the line, stations, and yards has not been very disruptive. Only a thousand or so acres were acquired, most of which were undeveloped or already used for transportation purposes. Of the 3,000 households and 450-500 businesses displaced, most have relocated within their community. Whether alternative BART alignments would have displaced greater or fewer numbers of businesses or households was not addressed.

Other cities planning major projects like BART should recognize that the most severe impacts will occur in the vicinity of cut-and-cover construction on streets with retail frontage. While it is difficult to prove BART's role in sales declines, the transit authority should nevertheless make a special effort to discuss and plan its actions with nearby merchants, to disrupt access to stores as little as possible, and to minimize the length of the construction period.

BART has sought to develop its surplus properties by obtaining rental income from short-term leases, negotiating interagency transfers and sales to adjacent property owners, and by offering prime parcels at periodic public auctions. BART generally has been successful at implementing its policies for disposal of surplus properties -- a valuable lesson for others planning for similar projects. The only major problems occurred in Berkeley, where community opposition has blocked a number of development proposals. Ultimately, though, the responsibility for planning to optimize reuse of surplus properties rests with local governments, not BART. A transit district can participate in joint corridor planning efforts, but it cannot, under current California law, become an active developer. However, much can and should be done to encourage transit-related development short of actual financial participation. The questions of a transit agency's role in development to recapture values created or to stimulate transit use was not a part of this study.

4. ACCESSIBILITY AND MOBILITY IMPACTS

INTRODUCTION

One of the first tasks of the project was to determine the differences between the transportation service BART offers and what would have existed in its place — the No-BART Alternative (NBA). This analysis was conducted by the Transportation System and Travel Behavior Project of the BART Impact Program with the objective of providing measures of BART's potential influence on travel patterns and its comparative advantage.[1] These measures then were used in analyzing BART's effects on location and development decisions, retail sales and shopping patterns, property prices and rents, and the resulting changes in the spatial distribution of population, employment, housing, and land use.

In the BART Impact Program, the concept of accessibility is defined as the potential impedence to travel between any two locations — origins and destinations — measured in terms of travel time and/or travel cost. When viewed in this fashion, actual travel behavior is ignored, and measures of accessibility changes — impacts attributable to BART — treat travel between all origins and destinations equally, whether or not people actually make such trips. If accessibility analyses include weighting factors to reflect travel patterns, this is defined as mobility analysis in the BART Impact Program. In both instances, an impact is expressed as the difference in travel time or cost — either weighted or unweighted — between theoretical travel on a BART transportation network versus travel on an NBA network. A weighted comparison simply reflects the distribution of people by work places and residence location in the San Francisco Bay Area and their travel patterns, while an unweighted comparison treats all potential trips equally.

Many people assume that BART has achieved one of its primary goals of serving long distance commuters by making San Francisco and Oakland much more accessible to outlying areas than ever before. As a result of this accessibility improvement, it also is assumed that more people travel to these central cities to fill the ever-increasing number of jobs found there. One of the principal objectives of the project is to investigate these assumptions and expectations, building first on an analysis of BART's accessibility impacts.

More specifically, the accessibility analysis effort was structured to answer the following questions:

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[1] For a complete, technical discussion of this analysis, see John Blayney/David M. Dornbusch & Company, Inc., **Accessibility Mapping** (Berkeley: Metropolitan Transportation Commission, March 1977) and Peat, Marwick, Mitchell & Co., Inc., **Exploratory Network Analyses of BART's Impacts on Accessibility** (Berkeley: Metropolitan Transportation Commission, July 1975).

- How did BART affect regional accessibility to employment centers and shopping centers?
- What are the differences in accessibility and mobility gains between peak and off-peak time periods?
- What are the differences in accessibility and mobility from old urban areas and outlying suburban areas to downtown employment centers and shopping centers? Where are the areas with greatest accessibility and mobility gains?

METHODOLOGY

Several accessibility and mobility measures were computed, each involving a different computation of zone-to-zone differences in travel time. This analysis relied on the MTC 440 Zone System and the computer-coded highway and transit networks for BART and the NBA. The study area included the greater BART service area — 239 zones in Alameda, Contra Costa, San Francisco and northern San Mateo counties. The following measures were judged the most useful for an assessment of BART's land use impacts:

- Changes in areawide accessibility based on an unweighted comparison of BART and NBA travel times between those 184 zones with transit service in both networks.
- Changes in accessibility and mobility to selected employment and shopping centers from all other zones in the service area.
- Changes in households' accessibility and mobility from selected communities to major workplaces served by BART.

For each of these measures, differences in transit travel times between BART and the NBA networks were computed for peak and off-peak time periods to show both potential gains (accessibility impacts) and actual gains (mobility impacts). To place these impacts in perspective, travel times on BART also were compared with travel times by automobile.

No specific analyses were conducted showing how minorities might have been affected differently because the Transportation System and Travel Behavior Project had already analyzed comparative travel times — BART versus the NBA — for minorities and other socioeconomic groups as one means of showing how BART potentially could improve accessibility for work, shopping, and social/recreational trips.[2]

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[2] Jefferson Associates, Inc., **Impacts of BART on Travel of Ethnic Minorities** (Berkeley: Metropolitan Transportation Commission, October 1977).

BART'S EFFECTS ON ACCESSIBILITY

Only in isolated instances has BART had a dramatic impact on areawide accessiblity, with less than 5 percent of the 239 traffic zones in the BART service area exhibiting gains in average travel time over 25 percent, in comparison with the NBA. The average improvement in accessibility is about 14 minutes (13 percent). In fact, due to the specification of the NBA, about 9 percent of the zones within the BART service area showed a decrease in areawide accessibility, primarily because areas formerly served by Greyhound now are served by BART feeder buses and the transfer time increases the total travel time.

Within the BART service area in 1975, about 510,000 people, 21 percent of the population, lived within zones from which BART offers a 15 percent improvement in areawide accessibility, and another 345,000, or 14 percent, lived in areas where BART offers an 11 to 15 percent improvement. From the standpoint of the workplace, BART offers about 216,000 jobholders, 19 percent of those working within its service area in 1975, an improvement in areawide accessibility of more than 15 percent, and an additional 256,000 or 22 percent potentially benefit from an 11 to 15 percent improvement in areawide accessibility. Proportionally, the greatest gains accrue to those living or working in Alameda County and northern San Mateo County.

Decreases in accessibility with the BART network potentially affect 76,600 people in Contra Costa County (13.7 percent of the population), 27,100 in Alameda County (2.6 percent of the population), and 21,850 in northern San Mateo County (12 percent of the population). Average travel time from zones in which these people live to all other zones common to both networks increases 14 minutes with BART.

To place these countywide summaries in perspective, Table 4-1 shows average travel times for BART and the NBA to 218 zones common to both networks for selected employment centers. For example, BART reduces the average transit travel time into the San Francisco central business district from all zones served from 73 minutes in the NBA to 63 minutes, a difference of 10 minutes or 14 percent. Similar gains are shown for the Oakland central business district and the Mission District of San Francisco. The Richmond central business district is less well-served by BART primarily because of the transfer required at the MacArthur BART station, which increases the total travel time to areas without through service from Richmond. Fremont shows greater gains in accessibility because of the clearly superior service BART offers longer distance travellers.

BART'S EFFECTS ON MOBILITY

When trips actually made are taken into account, the difference between BART and the NBA is less pronounced. For example, work trips to major employment

TABLE 4-1. ACCESSIBILITY IMPACTS: AVERAGE 1976 PEAK HOUR TRANSIT TRAVEL TIME COMPARISONS FROM ALL ZONES SERVED BY BART TO SELECTED EMPLOYMENT LOCATIONS

Employment Centers	Average Travel Time Savings With BART* Minutes	Average Travel Time Savings With BART* Percent Reduction
San Francisco Central Business District	10	14.0
Oakland Central Business District	13	16.0
Mission District	11	14.0
Richmond Central Business District	9	7.6
Berkeley	7	7.3
East Oakland	21	19.0
Fremont	82	37.0

*Computed as the difference in average peak hour transit travel time to all zones common to both BART and NBA networks using travel times plus time spent waiting for a BART train or bus or transferring weighted by a factor of 2.5.

Source: Metropolitan Transportation Commission

centers — San Francisco, Oakland, and Richmond central business districts; Mission District, Berkeley, and Fremont — average nine minutes less on the BART network than on the NBA, 36 versus 44 minutes, representing a savings of 20 percent. Trip time reductions range from one minute to Richmond to 13 minutes to East Oakland and 25 minutes to Fremont. By contrast, the accessibility analysis — comparisons which ignored actual travel patterns — showed an average travel time savings to these seven employment centers of 22 minutes with BART, a decrease of 30 percent from the NBA average. Individual transit trip time comparisons to selected employment centers are summarized in Table 4-2.

During off-peak hours BART's relative advantage decreases because the level of service offered is closer to that assumed in the NBA network. Average midday trip times to downtown San Francisco and Oakland were reduced three minutes and five minutes, respectively, differences of 9 and 12 percent. Trip time reductions to the Fruitvale and Bay Fair shopping centers are four minutes and five minutes lower on the BART network, but average off-peak transit travel times to the Mission District and El Cerrito Plaza are virtually identical on the BART and NBA networks. The individual trip time comparisons for these shopping areas also are given in Table 4-2.

TABLE 4-2. MOBILITY IMPACTS: AVERAGE TRANSIT TRIP TIME COMPARISONS TO EMPLOYMENT CENTERS AND SHOPPING AREAS (Peak Period Work Trips and Off-Peak Shopping Trips in Minutes)

	Average Trip Time Savings With BART	
Employment Centers	Minutes	Percent Reduction
San Francisco Central Business District	3.8	11.0
Oakland Central Business District	7.6	18.0
Mission District	3.4	10.0
Richmond Central Business District	1.3	3.3
Berkeley	6.3	16.0
East Oakland	13.5	28.0
Fremont	24.8	32.0
Average	8.7	20.0
Shopping Areas		
San Francisco Central Business District	2.8	9.4
Oakland Central Business District	4.5	12.5
Mission District	-0-	-0-
Fruitvale	3.7	9.8
El Cerrito Plaza	0.5	1.5
Bay Fair Center	5.1	11.5
Average	2.8	8.0

Source: Metropolitan Transportation Commission;
Peat, Marwick, Mitchell & Co., Inc.

This relatively modest impact on off-peak transit travel times would suggest shoppers' gains in mobility attributable to BART are likely to be small — a finding substantiated in part by the 1976 Passenger Profile Survey which showed that only 11 percent of the trips taken on BART are for personal business, shopping, doctors' appointments, banking, etc. Work trips, on the other hand, account for close to 60 percent of BART's patronage.

Looking at BART's effects on mobility from the perspective of those living in outlying communities, the analysis revealed savings in average work trip times ranging from eight minutes (14 percent) in Walnut Creek to 6.7 minutes (7 percent) in Fremont, six minutes (13 percent) in El Cerrito, and one minute (2 percent) in Richmond.

The transit trip time comparisons in themselves only show where the greatest gains in mobility are, given the specification of the NBA; they do not indicate where BART riders actually live. To complement this analysis and provide a basis for evaluating BART's effects on households' location decisions, housing construction, and development trends in the BART corridors, BART ridership by community was estimated using the 1976 BART Passenger Profile Survey. Communities with average BART ridership per thousand residents above the median (40.0) include Daly City (50.8), El Cerrito (56.6), Hayward (43.2), Pleasant Hill (40.5), and Walnut Creek (70.5), while the lowest ridership rates are found in Fremont (22.1) and Richmond (18.3). This analysis shows that BART ridership rates are correlated with mobility gains attributable to BART.

COMPARISON WITH HIGHWAY TRAVEL TIMES

Even though BART improves the level of transit service offered in the region, it still does not offer a clearly superior alternative, in terms of travel time alone, to automobile travel. Peak-period travel times by automobile still are much less than times on the BART transit network for nearly all types of trips. To downtown San Francisco, for example, the average time by car for travel from elsewhere in the greater BART service area would be about six minutes shorter than on BART, a 22 percent difference. To the top 50 employment zones in the three-county BART district, commute times by BART are almost twice as long as peak hour travel times by car (40 minutes on BART versus 26 minutes on the highways).

The advantage of travel by car is greater still during off-peak time periods. The time people spend getting to and from BART stations accounts for much of the difference.

CONCLUSIONS AND IMPLICATIONS

Although BART improvement in accessibility indicates a substantial potential for impact, changes in mobility demonstrate that this potential has yet to be realized. Travel by automobile is faster for most trips. From this, it is not surprising that BART's land use impacts to date have been small. Those contemplating similar rail transit investments should not expect marked changes in urban development patterns unless accessibility gains are reflected in actual ridership levels.

5. IMPACTS ON LOCATION DECISIONS

INTRODUCTION

The greater accessibility BART offered Bay Area residents was expected by many to have a significant impact on location decisions of workers, households, and businesses. Workers would gain from a transportation system that could ease commuting and expand job choice, and thus might favor locations close to BART stations. Households might take access to BART into account in deciding where to live, assuming their workplace were accessible by BART. New businesses were expected to take advantage of the improved access which BART provided to the workforce and to other firms by locating near stations. Along this same vein, some anticipated that these effects on locational decisions would reinforce the traditional employment centers of San Francisco and Oakland, while others thought that BART might induce decentralization. Finally, because of BART's primary effects on household and business location decisions, many expected a second round of effects from firms anticipating new locational patterns and locating their businesses where new growth was expected to occur.

In this project the factors affecting locational decisions were examined with specific attention to the relative importance of transit access and BART. The nature of the local job market and the ability of an individual to match his skills with those in demand generally determines whether or not an individual will be able to secure employment in that community. Inadequate transportation often is cited as the major stumbling block preventing unemployed people, particularly low income, inner city residents, from applying for suburban or outlying jobs. Transit systems typically have not catered to the reverse commuter. Whether BART caters to these needs and makes a difference in the job search process was one of the questions addressed.

Also examined was the importance of the journey to work in determining where people live. Some workers prefer to live close to their place of employment to minimize travel time and costs, while others opt for housing in a suburban community, with reduced housing costs or greater amenities but typically longer commute times and increased commuting costs to their place of employment. Because BART offers improved accessibility from certain locations, it may affect choice of a neighborhood or community. It might even have affected the initial decision to move, although this was judged unlikely.

In studying both workers' and households' location decisions, particular attention was given to measuring whether BART had different effects on specific socioeconomic groups, notably minorities. Since the primary beneficiaries of the system appeared to be white collar, long distance commuters, it was thought that minorities would be less likely to take BART into account in deciding where to live and work. Further, BART may have stimulated moves out of racially changing neighborhoods by offering improved accessibility from suburban communities. If BART did not serve minorities' workplaces, then it probably would not be an important determinant of workplace or even residence location.

Looking at the issue of employers' location decisions, four aspects were studied: BART's direct effects on location decisions; BART's indirect effects; the question of whether BART is encouraging centralization or decentralization of employment; and finally, whether firms considered visibility from BART important enough to attract them to a location near BART.

WORKERS' LOCATION DECISIONS

Methodology

To test for BART's effects on workers' location decisions, a two-stage survey was conducted to obtain a sample of workers who recently had changed jobs (in downtown San Francisco, downtown Oakland, and other East Bay workplaces, including an East Oakland industrial area). First, using an intercept interview, a pool of potential respondents fulfilling prescribed selection criteria was drawn for later telephone interviewing. People who lived outside the BART service area, for example, were excluded. The final sample was stratified to include workers who had changed employers within the past three years (job changers), whose employers had moved (location changers), or who had obtained their first job. Further, it was stratified to include 50 percent BART riders, rather than 25 percent — the proportion of BART riders found in the initial pool of qualified respondents. Thus the survey does not represent the population of workers at large. However, because the socioeconomic profile of the BART commuters rather closely matches that of others surveyed, the sample may be considered representative of the population of downtown San Francisco and Oakland workers changing jobs or job locations.

All told, 314 telephone interviews were completed covering job selection criteria, the relative importance of location and BART accessibility in job choice, current and prior commuting patterns, use of BART for interview trips, workplace and residence location, and socioeconomic characteristics of respondents. The survey data were analyzed statistically to test the research hypotheses.[1]

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1. For details on survey methodology, sampling procedures, questionnaire design and the hypothesis tests, see John Blayney Associates/David M. Dornbusch & Co., Inc., **Study of Workers' Location Decisions** (Berkeley: Metropolitan Transportation Commission, November 1977).

Profile of Workers Surveyed

In the San Francisco sample the typical worker changing jobs or job locations was a 30-year-old white college graduate who previously had worked in the BART service area. Sixty percent of those interviewed were male; 1976 median household income was $13,700. Overall, half of those interviewed were primary wage earners, and another 25 percent considered themselves "equal" wage earners — neither primary nor secondary. In terms of marital status, 42 percent were married; 20 percent were single, but shared their housing; 20 percent were living alone; 9 percent were single parents; and the balance were other types of households. Two out of three households were renters.

By contrast, the typical East Bay worker was slightly older — 32 years of age — and had a trade school or some college education. Forty-nine percent were male; 1976 median income was $10,800. About two-thirds of those surveyed worked in downtown Oakland; the remainder were employed elsewhere in Oakland and Berkeley. A greater proportion of minorities was interviewed in the East Bay sample than the San Francisco sample (37 percent vs. 20 percent), and close to half of these were black. Finally, almost all of those interviewed (94 percent) had regular access to an automobile, truck or motorbike. For these socioeconomic characteristics, differences between the San Francisco and East Bay workers were not found to be significant.

Close to 60 percent of the respondents who had changed employers, not just job locations, used to work in the BART service area. Among those now working in San Francisco, 18 percent immigrated from outside California. Immigrants in the Oakland sample only represented 12.5 percent of the total. A greater proportion of new entrants to the labor force was found among the East Bay workers than among the San Francisco workers. These differences are shown in Table

TABLE 5-1. FOR JOB CHANGERS SURVEYED, LOCATION OF PREVIOUS JOB, BY CURRENT WORKPLACE (Percent Distribution)

	Current Workplace	
Prior Workplace	San Francisco	East Bay
No previous permanent job	12.5	17.2
In BART service area	58.4	63.2
Outside service area, but in California	11.1	7.1
Outside California	18.0	12.5
	100.0	100.0
Total respondents	144	128
(Non-responses)	(1)	(3)

Source: John Blayney Associates, Tyler Research Associates

The occupational profile of workers surveyed resembles the distribution of job opportunities by occupation estimated by the State Employment Development Department for the San Francisco-Oakland SMSA, suggesting that the survey sample represents the universe of downtown workers changing jobs or entering the labor force. The principal differences between the SMSA profile and the workers surveyed — over-representation of white collar workers — may be attributed to the concentration of such employment opportunities in the central business districts of San Francisco and Oakland where most of the initial interviewing was conducted.

Factors Affecting Workers' Location Decisions

The Downtown Workers Survey was designed to elicit information about job location decisions prior to addressing the role of BART in the decision making process. Respondents changing employers or beginning to work for the first time were asked to indicate why they accepted their present job and how important the specific location was in their decision. Those considering location as a decision making factor then were asked a series of questions about the relative importance of various location attributes, including transportation access and specifically BART. Only at the conclusion of this sequence was BART mentioned to avoid biasing the respondents. The interviewers began with an open-ended question and probed for additional reasons either for accepting a job or considering location important. Then the respondents were asked to indicate which one of the reasons was most important.[2]

Reasons for Choosing a New Job. Overall, job-related reasons dictated the decisions to accept a job with better pay, better benefits, better job, and interesting work being mentioned most frequently in the survey. Most people interviewed had a choice of jobs and/or job locations; only 18 percent stated that it was the only job offered or available. BART riders had greater choice than other workers surveyed probably because more than half of them were college graduates.

Transportation-related reasons were mentioned by 17 percent of the respondents. However, as a proportion of the total number of reasons given, factors such as a shorter, easier or cheaper commute or access to public transportation and BART were relatively unimportant. Eleven percent of the BART commuters volunteered access to BART as a reason for accepting their present job, but this only represented 4 percent of the total number of reasons mentioned. Other reasons affecting job location decisions included proximity to family and friends (mentioned by 16 percent of the respondents), an attractive location (11 percent), a Bay Area location (7 percent), and transferred by employer (5 percent).

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[2] For the respondents changing job locations, but not employers, a different sequence of questions was formulated to address the possibility that they might have considered looking for a new job and to explore the relative importance of BART in their decision making. However, only seven of the 57 "location changers" thought of looking for another job because of the change — hardly a sufficient sample for analysis.

Importance of Location in Job Choice. When asked about the relative importance of a specific location in deciding whether or not to accept a job offer, two-thirds of those surveyed indicated that it was a consideration ranging in importance from major to minor. Expanding on their responses, half of these workers stated that the specific location of the job was important -- in California or the Bay Area, close to home, downtown, near a shopping center or close to another place — and half considered location in terms of accessibility — the journey to work. Eighteen percent evaluated the job location in relation to travel time or travel distance from home (the percentages do not add to 100 because of multiple responses). In terms of a potential BART impact, the first group would be concerned with the physical location of stations and the system configuration, while the second and third groups would look at the transportation service BART offers relative to other modes.

Among the BART commuters considering location important, access to BART was the most frequently volunteered reason (23 percent of the total), while for the others surveyed access to public transportation, but not specifically BART, was the reason mentioned most often (27 percent). San Francisco and Oakland respondents viewed access to public transportation about equally, and Oakland workers favored BART somewhat more often than San Francisco workers.

Respondents hoping to minimize the journey to work by finding a job close to home for the most part chose an Oakland or East Bay workplace. San Francisco workers mentioned this reason half as frequently as Oakland workers (6 percent vs. 15 percent). San Francisco workers also mentioned commute factors as the most important reason about one-third as often as Oakland workers (3 vs. 8 percent). For them the perceived benefits of a downtown location outweighed the costs of potentially longer commutes.

BART's Effects on Job Location Decisions

The desirability of a specific job location often is a function of BART accessibility. Among workers surveyed, at least one in four gave some consideration to proximity to BART in choosing a job or looked for a job with the expectation of commuting by BART. Further, approximately one in three of those surveyed used BART at least once for job interview trips.

In both job search and job location decisions BART appealed not only to those who formerly commuted by BART, but also to bus riders and workers who commuted by car, indicating that this impact is not limited solely to the transit-dependent or the accustomed transit rider. However, those who formerly commuted by transit valued proximity to BART much more highly than those who did not, suggesting that transit use can condition future location decisions (see Table 5-2.

TABLE 5-2. IMPORTANCE OF A JOB LOCATION NEAR BART FOR BART COMMUTERS VS. OTHERS SURVEYED (Percent Distribution)

	BART Commuters	Others Surveyed
Proximity to BART		
—Major consideration	31.3	7.6
—Minor consideration	32.1	16.6
Looked for work in areas with expectation of using BART	39.7	20.7
Looked for work in areas only because of BART	38.5	36.7
Total respondents	131	145

Source: John Blayney Associates, Tyler Research Associates

Those most interested in proximity to BART were downtown San Francisco workers commuting from the East Bay. In fact, this group viewed BART as an important factor in job location decisions twice as frequently as San Francisco workers living in the City itself or northern San Mateo County (57 percent vs. 27 percent). The large number of jobs in downtown San Francisco close to BART, Bay Bridge congestion, and high parking charges cause East Bay residents employed in San Francisco to have a high propensity to use transit, which explains BART's influence on their job location decisions. By contrast, people living and working in San Francisco have a transit orientation, but are not as influenced by BART because the San Francisco Municipal Railway (Muni) provides most of the service.

In sum, BART did not constrain job location decisions and rarely dictated job choice, but it was an amenity that often entered into the decision making process. As was expected, those most sensitive to BART's advantages were the long distance commuters.

After examining the effects of BART on job location decisions of all workers surveyed, the next step was to determine whether BART affects job locations of specific socioeconomic groups differently, particularly minorities. These analyses compared socioeconomic characteristics of respondents influenced by BART in their workplace location decisions with those who were not. Only occupation, age, and change in marital status were found to be significant factors. Income, principal versus secondary wage earner, household size, education, sex, and minority status did not explain differences in BART's influence. Specific findings are:

— Some categories of white collar workers (e.g., clerical workers) are more clearly influenced than other white collar workers (e.g., professional and technical workers); similar variations occur among blue collar workers. Both low income and concentration of jobs around downtown stations for those most influenced by BART may explain this relationship.

— Those under 30 years of age are almost twice as likely to be interested in BART as older workers — an expected difference given that these persons are new to the labor force and many do not yet have incomes that would allow them to drive.

— Respondents who had a change in marital status during the past year were three times more likely to view BART as a major factor in their job choice than those having had no change (53 percent vs. 17 percent). Formation of a household may bring a change in the length of the journey to work, in the availability of an automobile, or in the desire to have alternative transportation modes available. Change in marital status may correlate with importance of job access by BART because accompanying recent or planned changes in job or residential location have caused those respondents to evaluate transportation options.

— Those living within 20 minutes walking distance of BART were as interested in proximity to BART as those within 10 minutes driving distance. But both these groups were much more interested in BART than respondents living further away for whom BART offers no commute benefits.

— Both minorities and women expressed slightly greater interest in BART as a factor in job choice than white males, but the difference was not statistically significant.

Compared to the No-BART Alternative, BART's effect on job location decisions may be greater because of its appeal to the non-transit rider — the "hedger" interested in the option to commute by BART who does not ride BART now. Further, to the extent that BART increases capacity in the Bay Bridge corridor more than the NBA, it will have a greater influence on downtown San Francisco location decisions over time than the NBA because the transbay commuters, both BART riders and non-riders, are most sensitive to the advantages BART offers. Outside San Francisco, differences between BART and the NBA may not be apparent until highway congestion and parking prices increase. Even then, the NBA would not be able to accommodate the same ridership as BART. Finally, because BART is a highly visible, well-publicized transportation improvement it should have a greater impact on workers' location decisions than the NBA. BART's amenities, such as direct entrances from offices in downtown San Francisco and the Oakland City Center to the BART system are unquantifiable factors that clearly distinguish it from the NBA.

HOUSEHOLDS' LOCATION DECISIONS

Methodology

The research approach used to test for BART's effects on households' location decisions was similar to that employed in the study of workers' location decisions. Here the objective was to obtain, for subsequent interviewing, a sample of households that recently had moved. The survey focused on households moving into San Francisco's Mission District and suburban Walnut Creek and out of East Oakland since 1975. All told, 315 telephone interviews were completed, covering moving and residential location decisions; the relative importance of BART accessibility and proximity to BART, and other criteria governing neighborhood choice, current and prior commuting patterns, job location, and socioeconomic characteristics of respondents. The survey data then were analyzed statistically to test the research hypotheses.[3]

Profile of Movers Surveyed

In the Mission District the typical mover surveyed was under 35 years of age, a trade school or college graduate, and employed in a white collar occupation. Thirty-one percent were professionals, 16 percent service workers, 14 percent clerical workers, and the balance distributed among the other occupations. Minorities represented in the sample include persons of Spanish heritage (12 percent), Asians (12 percent), and blacks (2 percent). Close to 31 percent were married; average number employed was 1.6 persons per household; and median household income (1976) was $9,900.

The Walnut Creek sample was somewhat older, more highly educated, predominantly white, and most of the household heads (60 percent) worked in the highest status occupational category — professional-technical, proprietors, managers, and officials. Less than 5 percent of the Walnut Creek movers were in any of the minority groups (4 percent were Asian), a finding consistent with the 1975 Special Census which reported 96 percent of Walnut Creek residents as white. Most households moving into Walnut Creek were married couples with children (79 percent); average number employed per household was 1.6. This sample also included a high proportion of upper income households; median 1976 household income was $26,900.

Those moving out of East Oakland included the greatest proportion of younger, less educated minorities working in blue collar or clerical occupations. Nearly 11 percent were unemployed vs. 5.6 percent of the Mission District respondents and 5.8 percent of the Walnut Creek respondents. While a majority of East Oakland residents are black (51 percent, according to the 1970 Census), 35 percent of survey respondents were black and 60 percent were white. In contrast to the Mission group, almost 70 percent of the households were composed of married couples, and the average number employed was 1.6. The median household income for East Oakland movers was $14,700 in 1976. Statistics comparing the characteristics of movers surveyed in 1977 with residents surveyed in 1973 and 1974 are presented in Table 5-3.

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[3] For details on survey methodology, sampling procedures, questionnaire design, and the hypothesis tests, see John Blayney Associates/David M. Dornbusch & Co., Inc., **Study of Households' Location Decisions** (Berkeley: Metropolitan Transportation Commission, February 1978).

Modes of travel to work varied significantly among the three survey samples. BART ridership proportionally was highest among Walnut Creek respondents with 25 percent of household heads using it for commuting purposes, vs. 16 percent in the Mission District and 6.7 percent in East Oakland.

Factors Affecting Households' Location Decisions

The Household Survey was designed to elicit information about a household's decision to move from one neighborhood to another prior to addressing the role of BART in the decision making process. Respondents were asked two open-ended questions:

- Why did you decide to move?
- Why did you choose your present neighborhood?

Up to this point in the interview neither BART nor public transit had been mentioned, the objective being to avoid biasing the respondent. After the respondent had given two or three reasons for moving, he or she then was asked to indicate which one of the reasons was the most important. The following sections describe the specific reasons for moving and location decisions.

Reasons for Leaving a Neighborhood. By far the most frequently mentioned reasons for moving focused on the need for a different kind of housing — a larger, smaller, or better space. All three samples viewed this factor as most important in the moving decision; differences among them are not pronounced. Next in terms of relative importance was a job transfer, confirming the thesis that people follow jobs. The journey to work (commute reasons) as a determinant of residential location rarely was mentioned as the most important reason, and only among Mission District and East Oakland movers was it cited with much frequency (6 percent) as one of several reasons for moving. Mission District respondents were the most concerned, mentioning commute reasons as the most important three times more frequently than other movers.

Less than 1 percent of the respondents indicated that BART was a reason to move from their old neighborhood. The greatest proportion of people wanting to move in order to become homeowners was found in the Walnut Creek and

TABLE 5-3. COMPARISON OF SOCIO-ECONOMIC CHARACTERISTICS OF MOVING HOUSEHOLDS SURVEYED WITH RESIDENTS SURVEYED IN THE 1973-74 BART IMPACT TRAVEL SURVEY (PERCENT DISTRIBUTION)

	Mission District		Walnut Creek		East Oakland	
	Movers Survey (1977)	Residents Survey (1974)	Movers Survey (1977)	Residents Survey (1973)	Movers Survey (1977)	Residents Survey (1973)
AGE						
Under 25	14.9	18.1	9.3	11.7	2.9	15.5
25 to 34	55.1	33.6	32.4	20.0	54.3	25.1
35 to 44	16.8	15.2	28.4	25.8	28.6	13.2
Over 44	12.2	33.1	28.3	42.2	14.4	46.3
	100.0	100.0	100.0	100.0	100.0	100.0
EDUCATION						
Less than H.S. Graduate	5.6	28.3	1.2	9.1	11.4	27.4
High School Graduate	13.1	26.4	13.3	25.6	28.6	35.7
Trade School or 1-3 Yrs. College	32.7	22.0	27.1	26.2	28.6	22.5
College Graduate or Higher	46.7	22.9	56.6	38.4	28.6	13.7
Refused ED	1.9	0.5	1.7	0.7	2.8	0.8
	100.0	100.0	100.0	100.0	100.0	100.0
OCCUPATION						
Professional, Technical	32.7	17.6	36.8	28.0	19.3	12.0
Proprietors, Managers, Officials	8.0	3.4	26.9	37.0	9.7	15.7
Sales Workers	6.9	--	15.4	7.1	3.3	6.0
Clerical	14.9	13.5	5.5	1.9	12.9	7.7
Craftsmen, Foremen	8.9	19.3	6.8	14.1	22.6	19.7
Operatives	5.9	14.5	1.8	2.4	12.9	16.3
Service Workers	16.9	15.2	4.2	7.6	6.4	11.3
Laborers	1.0	8.8	0.6	1.4	6.4	8.7
Private Household Help	--	7.1	--	--	--	--
Military	1.0	--	0.6	--	--	1.7
Other	3.9	0.7	1.3	0.5	6.4	0.7
Total Employed	100.0	100.0	100.0	100.0	100.0	100.0
ETHNICITY						
White	73.8	60.2	94.8	96.5	60.0	60.7
Spanish American/Spanish Heritage	12.1	23.8	0.6	1.9	5.7	7.2
Black	1.9	6.0	0.6	0.5	34.3	26.1
Asian	12.1	8.3	4.0	1.0	--	4.4
American Indian	--	0.5	--	--	--	--
	100.0	100.0	100.0	100.0	100.0	100.0
Total Respondents	107	420	173	427	35	387

Source: John Blayney Associates, Metropolitan Transportation Commission

East Oakland samples. This was to be expected given the preferences of people moving out of inner city areas into suburban communities and the limited home ownership possibilities in the Mission District. People moving into the Mission District indicated more than twice as often (13 percent vs. 5-6 percent) that the most important reason for their move decision was a change in family composition. Mission District movers mentioned homeownership reasons about half as often as movers in the other two samples.

One reason for including the East Oakland sample in the survey was to test BART's effect on households moving out of racially changing neighborhoods to see whether it might be having an influence on "white flight". Two of the respondents specifically stated that they moved because "the racial composition of the neighborhood was changing"; another five indicated that a change in the old neighborhood was a reason for their move. Thus, 20 percent of the East Oakland movers definitely were concerned about their former neighborhood's "change".

Reasons for Choosing a Residence Location. Once the decision to move had been made, neighborhood considerations were mentioned most frequently by all respondents and were given as the most important reason about as often as the price of housing (see Table 5-4). People mainly looked for an attractive area with housing they could afford. Schools were valued highly by about 10-16 percent of the Walnut Creek and East Oakland movers, but did not enter into the decisions of Mission District households. This difference primarily is due to the predominance of households with children in the Walnut Creek and East Oakland samples, 60 percent of the total vs. 20 percent in the Mission District sample, and the poor reputation of San Francisco schools.

Commute reasons relatively were more important in the location decisions than in the move decisions, particularly among Mission District respondents. However, almost all respondents mentioning BART as a factor in their location choice lived in Walnut Creek. Even there, BART's importance in the choice was relatively minor; only 5 percent of the Walnut Creek respondents volunteered BART as a factor in their location decision; 3 percent stated it was the most important reason.

Travel time and cost considerations were offered as reasons for selecting a specific neighborhood more frequently by Mission District and East Oakland movers than by Walnut Creek movers, suggesting that suburban movers either work nearby or would not have moved if they did not value other factors more highly than work trip time.

Relative Importance of Locational Factors. To gauge the relative importance of BART vis-a-vis other factors affecting residential location decisions, each respondent was asked to indicate whether a specific concern was a major con-

TABLE 5-4. RELATIVE IMPORTANCE OF FACTORS AFFECTING LOCATION DECISIONS (PERCENT OF TOTAL RESPONSES)

	Walnut Creek Movers		Mission District Movers		East Oakland Movers	
	Major Consideration	Minor Consideration	Major Consideration	Minor Consideration	Major Consideration	Minor Consideration
Availability of Schools	45.1	17.3	11.2	14.0	37.1	11.4
Availability of Shopping and Other Services	31.2	44.5	36.4	33.6	25.7	34.3
Housing Type: Single Family vs. Apartments	75.1	14.5	37.4	30.8	45.7	28.6
Neighborhood Character:						
— Suburban	74.6	15.0	7.5	11.2	14.3	17.1
— Urban	15.0	15.6	50.5	20.6	34.3	17.1
Neighbors Similar to Movers	27.2	34.1	33.6	29.9	22.9	28.6
Ethnic Diversity in Neighborhood	9.8	29.5	30.8	37.4	25.7	20.0
Easy Access to Work	56.6	27.7	57	21.5	51.4	22.9
Neighborhood Location	43.4	29.5	35.5	27.1	22.9	40.0
Access to Public Transit	31.8	34.7	55.1	21.5	34.3	31.4
Access to BART	31.8	29.5	12.1	27.1	14.3	14.3
Total Respondents	173	173	107	107	35	35

Source: John Blayney Associates, Tyler Research Associates sideration, a minor consideration, or not a consideration at all. In Walnut Creek, three out of four respondents indicated that housing and neighborhood questions were of paramount concern, while less than half of those in the Mission District and East Oakland samples answered in a similar fashion. Ease of access to employment for the principal wage earner was the next most frequently mentioned major consideration in Walnut Creek and was the most often cited major consideration for the Mission District and East Oakland movers. In the Mission District, access to public transit, but not specifically BART, also was viewed as a major consideration by about an equal proportion of people (55 percent) as considered access to work important (57 percent). When the respondents were directly asked about the importance of BART, the Walnut Creek respondents ranked it as a major consideration two and a half times more frequently than respondents in the other two samples. Specifically, 61 percent of the Walnut Creek respondents stated that access to BART was either a major or a minor consideration in their location decision, compared with 39 percent of the Mission District respondents and 28 percent of the East Oakland respondents.

BART ranked in sixth place as a major consideration for Walnut Creek movers; more people thought other factors were of greater importance. By contrast, among Mission District and East Oakland movers, BART was close to the bottom of the list as a major consideration in most respondents' minds. As a minor consideration in the location decision, BART gained some support in the Mission District sample, but its relative position in the East Oakland sample remained low. In fact, over 70 percent of the East Oakland respondents indicated that BART was not a consideration, a higher negative response rate than tabulated for any other factor.

BART's Effects on Households' Location Decisions

Long distance commuters who recently moved to Walnut Creek and work in downtown San Francisco and, to a lesser extent, downtown Oakland took BART into account in their residential location decisions. For inner city residents, particularly the transit dependent, BART was a relatively unimportant factor in choosing a neighborhood. The principal findings of the Household Survey can be summarized as follows:

- BART has had virtually no influence on the initial decision to move, and proximity to BART rarely was the determinant of residential choice. Relative to other factors, BART's influence on location decisions was quite small and mainly affected those working in the BART service area.
- Only among Mission District movers, who primarily were lower income, unmarried renters, did a change in job location prior to a change in residence location increase BART's importance in neighborhood choice. Even though such a sequence of moves may have increased an individual's awareness of transportation and commuting options, the likelihood of using BART was unaffected.

- BART has not stimulated moves out of older urban areas in the sense that such moves were made because of BART accessibility at other locations. Housing needs and, to a lesser extent, inadequate neighborhood services, cause such moves. However, in the location decisions of middle income movers leaving such areas, BART was a more important factor than in those of lower income movers. At given income levels, there were no discernible differences between minority and non-minority respondents.

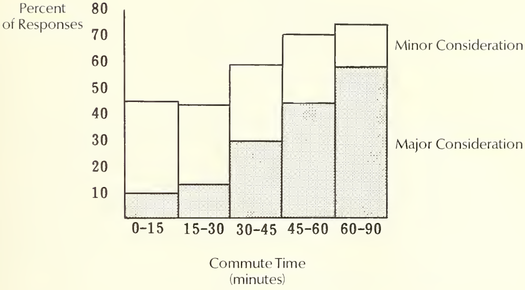
- Most BART riders surveyed (85 percent) took proximity to a BART station into account in residential location decisions, but more importantly, 40 percent of the commuters who now drive or take the bus to work also considered BART in choosing a neighborhood in which to live. For these households, BART represented an opportunity to keep transportation options open.

- Walnut Creek movers valued access to BART more often than Mission District movers primarily because of the service it has provided to downtown San Francisco, Oakland, and other major employment centers. Most Mission District workers found Muni more convenient. Those living within 10 minutes driving time were influenced as frequently, proportionally, as those within the same walking time, suggesting that close geographic proximity is a relatively unimportant factor in explaining BART's impacts on location decisions.

- Those who considered BART in their location decisions also were willing to pay a premium for housing near BART, but location relative to the station itself — within or beyond walking distance — had no significant effect on response.

Those most influenced by BART tended to be older, better educated, and higher paid than respondents who did not consider BART in their location decisions. Further, owners tended to be much more interested in BART as an amenity than renters, possibly because they have a longer-term perspective. For them, the prospect of potential future highway congestion and significantly higher auto commuting costs, possibly due to gasoline shortages and/or high central city parking charges, may have increased the importance of proximity to BART as a means of protecting their investment in a home. Finally, BART's importance in residence choice is highly correlated with commute times, with long-distance travellers clearly favoring BART (see Figure 5-1).

FIGURE 5-1. RELATIONSHIP BETWEEN BART'S IMPORTANCE IN RESIDENCE CHOICE AND COMMUTE TIMES



Source: John Blayney Associates, 1977 Household Survey

Comparisons with the NBA — the MTC-defined regional bus transit system that might have existed in the absence of BART — showed that movers most influenced by BART are not necessarily working in the areas to which BART offers the greatest improvement in accessibility. However, to the extent that BART increases capacity in the Bay Bridge corridor more than the NBA, it will have a greater influence on location decisions over time than the NBA because the transbay commuters, both BART riders and non-riders, are most sensitive to the advantages BART offers. Further, BART's impacts on the location decisions of those now commuting by car or bus suggests that a highly visible, well-publicized transportation improvement will have a greater effect on decision making than patronage alone would suggest. If this is true, then the NBA with its marginal additions to an existing bus fleet and modest changes in service levels would not have influenced the decisions of "hedgers" as much as BART did.

The demand for housing within walking distance of BART appears weak, but respondents may have been unable to visualize a desirable residential environment near the BART stations they know. The low proportion of people moving into the Mission District who considered BART an important amenity suggests that rehabilitation or redevelopment to capture a BART market is not justified in older urban areas. However, this statement might not be accurate for an urban residential area not served as well by other transit as is the Mission by Muni.

Responses of Walnut Creek movers suggest that BART is affecting the suburban housing market, but that this impact is not limited to the immediate station area. Further, this market is much more likely to be looking for townhouses and single family homes than for rental apartments. While a transit-oriented rental market for high density, station area housing may exist, the Household Survey provides little evidence that it is very large. However, few of the respondents who wanted to live near the station may have been able to find housing within walking distance.

EMPLOYERS' LOCATION DECISIONS

Methodology

This study principally relied on interviews with individuals who participated in or were familiar with firms' location decisions. Thirty-five informants were interviewed specifically for this study. Information was also obtained from 36 interviews conducted in other BART Impact Program studies. Representatives from 50 different businesses were interviewed, including many major corporations. Twenty-one of the firms had moved to their present locations since 1965, and five currently are in the process of moving.[4]

BART's Effects on Employers' Location Decisions

Overall, BART has affected employers' location decisions minimally. BART has not induced firms to leave one city for another. It has not caused businesses to stream back to the older central cities, nor has it encouraged movement to the suburbs.

Forty-four percent of the 50 firms interviewed considered accessibility to their labor force and/or to other firms in their choice of locations (see Figure 5-2). Other firms based their decisions entirely on other factors, such as site availability, size, cost and aesthetics. Generally, however, firms desiring good access to the labor force do not rank this factor very highly once some minimum level of access is obtained. The exceptions fall into three categories: those firms that seek access to some particular labor force, those that are relocating and wish to minimize the disruption of the relocation, and those that have made a policy decision to provide good access because so many employees rely on public transportation.

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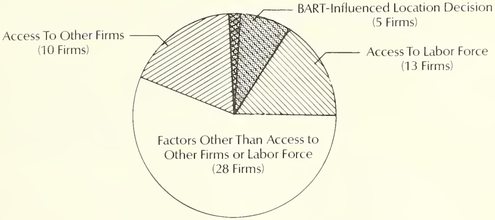
[4] While this sample obviously does not represent all the firms possibly influenced by BART, most of the firms moving toward or away from BART stations were interviewed. For a complete, technical discussion, see John Blayney Associates/David M. Dornbusch & Co., Inc., **Study of Employers' Location Decisions** (Berkeley: Metropolitan Transportation Commission, March 1978).

FIGURE 5-2. FACTORS AFFECTING EMPLOYERS' LOCATION DECISIONS



A few of the firms to which access was an important consideration reported that BART did influence their choice of location, but that its influence was not great. Table 5-5 summarizes the results of interviews with firms considering access to the labor force in their location decisions.

TABLE 5-5. BART AND LABOR FORCE ACCESS IN LOCATION DECISIONS

Location Decision Criteria	Number of Firms to Which This Was Important	Number of Firms Influenced by BART
Access to a particular labor force	2	0
Minimize move's disruption to current employees	5	2
High employee reliance on public transit	3	3
Access to employees (unspecified)	3	0
Total	13	5

Source: David M. Dornbusch & Co., Inc.

Several firms indicated that access to other firms was a major factor in their choice of location. The more important this factor, however, the more likely it was that these firms chose to locate within walking distance of the other businesses, and, consequently, the less significant BART was found to be. Only one of these firms was influenced by BART; however, that particular firm also considered labor force access in its location decision (see Table 5-4).

TABLE 5-6. BART AND ACCESS TO OTHER FIRMS IN LOCATION DECISIONS

	Location Decision Criterion: Access to Other Organizations
Number of Firms to Which This Factor Was Important	10
Number of Firms Influenced by BART	1

Source: David M. Dornbusch & Co., Inc.

BART is not used by those firms with the most frequent traffic to and from other businesses (banks and savings and loans). Other firms do use BART occasionally, primarily between San Francisco and the East Bay. Reasons given by informants for not using BART more frequently for long distance, inter-firm travel were BART's unreliability, inconvenience, lack of airport connections, and the relative ease of using highways during non-peak hours.

Although firms were not found to be influenced by BART to move from one city to another, BART was found to have encouraged some central city firms to remain in the central cities. Four firms were identified as having been influenced to some extent by BART in their decisions to remain in Oakland (3) and San Francisco (1). This effect on centralization may grow more important as traffic congestion and other impediments to commuting worsen. Without BART, congestion in the central cities might increase to the point that many firms would be tempted to leave in order to improve access to their work force. Thus, while BART alone will probably not stimulate many firms to move to the central cities, BART may maintain the central cities as attractive locations for the firms already there.

Although the sample is small, BART appears to have had greater impact on the location decisions of public entities than on those of private firms. Three of the five employers expressing that BART had influenced their decisions were government organizations, whereas fewer than 5 percent of the private firms' decisions were affected by BART. The reason for this difference may be that private businesses are bound by market forces, and do not yet perceive BART as a market factor, while government agencies are freer to establish new patterns and encourage the use of public transit.

No firms have yet moved to an area to benefit from an expected BART-induced growth in households. Banks and savings and loans attempt to anticipate new development patterns in their location decisions by forecasting household business growth. So far, however, none of the five banks or savings and loan institutions interviewed has noted a BART effect on an area's growth, and none has located a new branch in anticipation of such growth.

A field survey and follow-up interviews found three retail and service firms that appeared to have responded to BART's proximity by orienting their buildings toward BART or by erecting large signs facing BART. In fact, only one (Walnut Creek's Cost Plus Import Store) reported that BART was an important factor in its choice of a location across the street from the BART station. In general, firms do not locate near BART to benefit from the exposure it provides. Rather, firms that have located near BART for other reasons sometimes exploit their proximity with signs facing the tracks.

CONCLUSIONS AND IMPLICATIONS

A better understanding of how BART affects locational decisions can aid in formulating land use and urban development policy. The findings of these three studies suggest the following policy implications:

Implications of BART's Effects on Workers' Location Decisions

First, because BART is recognized as an amenity by office workers and sales workers, it provides support for continued centralization of office space and the retail core. BART has some effect on employment opportunities to the extent that some workers sought employment in specific areas only because of BART access. Over time this might make the labor market somewhat more competitive as workers' mobility is increased.

Second, because BART appears to affect the location decisions of both riders and non-riders alike, the long-term prospects for increased patronage from downtown workers may be greater than extrapolation of trends based on ridership surveys might suggest. Further, if local communities encourage housing developments, particularly mixed developments offering homeownership opportunities within station areas, and also within catchment areas served by feeder busses or accessible by car, then BART's effects on workers' location decisions and commuting patterns could be even greater because the journey to work remains an important determinant of workplace location choice.

Third, the importance of service levels and door-to-door travel times should not be underestimated. Among workers surveyed, the most frequently mentioned reasons for not using BART were that the system was inaccessible from home and that the service was poor. With extensive neighborhood feeder service, good train schedules, and minimum transfers, BART's potential for affecting location decisions will be greater than it is today, but even then it is unlikely to be a major determinant of job choice.

Implications of BART's Effects on Households' Location Decisions

First, because BART has virtually no impact on moving rates (the initial decision to move) in the three areas surveyed, population growth (or decline) in the central cities and older urban areas may be unaffected unless job locations also are affected. Changes in housing needs cause people to move most, and the journey to work remains a critical determinant of residential location along with local market conditions, public services, and neighborhood amenities. Consequently, the housing market in such areas is likely to be affected only to the extent that BART affects locational decisions, and draws people to the suburbs who otherwise might have considered an inner city location.

Second, because BART influences location decisions, it will have some effect on corridor growth rates and development patterns, but will **not** under current conditions provide sufficient impetus for clustering of much high density housing around suburban automobile-oriented stations. Some households are attracted to or would pay a premium for a station area location, and over the long run a market for housing close to BART may develop. Careful planning and marketing will be required to make expectations become reality. If communities want to encourage station area development, they should provide for a mix of housing within walking distance, catering to couples and families as well as single persons. Housing options should include townhouses and condominium apartments, as well as apartments for rent by various household types.

Third, to the extent that BART plays a role in the centralization of office space, or at least delays decentralization, it will affect the housing markets in the suburban communities it serves, transferring a certain amount of development pressure from areas not directly served. However, the overall rate of suburbanization will not be affected because BART is a relatively unimportant factor in moving and location decisions.

Fourth, household heads who use the bus or auto for work trips may move to a location near BART to keep their transportation options open. For them, minor service improvements, satellite parking lots and good feeder bus service may be sufficient incentives to begin to ride BART. Analysis of the access needs of this subgroup should be considered a priority item in long-range planning for increased BART use. Likewise, local governments should consider this impact in formulating station area land use plans.

Implications of BART's Effects on Employers' Location Decisions

The finding that BART has minimally influenced the locations of major employers is important for other cities. New sources of employment cannot be induced to locate in an otherwise unattractive area merely because it is served by a new transit system. Sufficient economic potential must exist in a site before it will be considered as a location for a firm. Viewed in this perspective, BART's inability to revitalize dramatically the declining, older cities is not surprising.

In the future, as traffic congestion becomes ever more severe, BART can be expected to play a more important role in the location decisions of Oakland and San Francisco employers. By improving access to labor, BART can enable firms that otherwise would have moved out, to remain in the central cities. Although BART will probably never act as a positive centralizing force, it may forestall decentralizing trends and enable the central cities to retain their traditional pre-eminence.

6. IMPACTS ON DEVELOPMENT DECISIONS

INTRODUCTION

BART was expected to influence Bay Area decisions on where and whether to build new housing and commercial facilities, as well as decisions to remodel and rehabilitate existing housing and commercial space. This could happen either directly through developers anticipating BART's effects on demand, or as a result of increasing demands for BART-related housing and commercial space from a shift in location preferences by households, workers, or employers. At times, government agencies and major employers who build their own buildings make both development decisions and location decisions, while housing developers or builders of speculative commercial space are just making development decisions.

BART's planners anticipated that the system would "stimulate greater development of clusters of businesses, industry, and homes."[1] It was reasoned that stations would lead to higher density development located to take advantage of proximity to a station. In order to evaluate whether this has happened, analysis of BART's effects on office development focused on the following questions:

- Has new office construction tended to cluster around BART stations?
- Has BART attracted new office construction away from the traditional commercial centers to outlying areas or to older commercial or residential areas served by the system?
- To what degree has BART-induced new office construction replaced older commercial office space or other uses -- especially in low income and minority areas?
- Has new construction attributable to BART represented a significant change in type and/or density of office use?

Analysis of BART's effects on retailers' development decisions focused on whether location decisions of any major retailers had been influenced by BART.

Some of the key questions asked in the assessment of BART's effects on the housing industry were:

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[1] Parsons, Brinckerhoff, Tudor, Bechtel, **Composite Report - Bay Area Rapid Transit** (1962), p. 82.

— Has BART caused cluster housing or increased density of new development in urban or suburban station areas?

— Has BART induced residential development beyond outlying stations in areas previously perceived to be beyond commute distance to San Francisco and Oakland?

— Has BART induced residential rehabilitation and redevelopment in declining neighborhoods adjacent to stations?

— Have residential developers tended to locate new houses and apartments away from areas exposed to BART noise?

Finally, BART's effects on development decisions of public agencies were evaluated. This included decisions on the location of new public buildings and decisions on redevelopment projects.

COMMERCIAL DEVELOPMENT DECISIONS

Methodology

The study's principal methods were key informant interviews and a time series analysis of building permit data for each city and station area in the BART region. The station area was defined as the area within one-third mile of a BART station, except for downtown San Francisco (two blocks) and Fremont (.6 mile). Each city's and station area's share of regional office construction during the 1960-1977 period was examined for changes in office construction patterns that might be BART-related. To supplement and interpret the building permit analysis, developers, realtors, bankers, city officials, investors, major employers and community leaders who were knowledgeable about office construction decisions were interviewed. Major retailers also were questioned about whether BART was a factor in development decisions. In all, over 50 interviews were conducted.[2]

Effects on Construction of Office Space

BART has not yet caused a redistribution of office space in the Bay Area. Figure 6-1 shows that there has been substantial change in the location of new office construction since BART began operation, the suburban cities' share increasing at the expense of the inner cities' share. But neither building permit analysis nor key informant interviews attribute the shift to BART.

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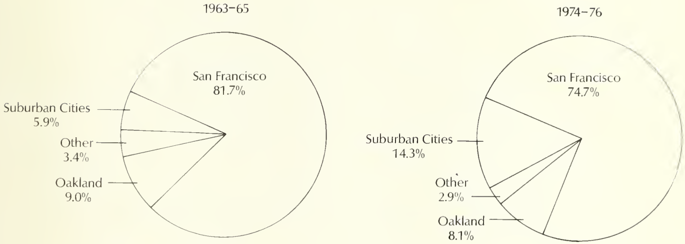
2. For a complete, technical discussion of the research objectives, methodology and findings, see John Blayney Associates/David M. Dornbusch & Co., Inc., **Study of the Office Construction Industry** (Berkeley: Metropolitan Transportation Commission, August 1977).

FIGURE 6-1. DISTRIBUTION OF NEW OFFICE CONSTRUCTION IN THREE-COUNTY BART SERVICE AREA



Source: David M. Dornbusch & Co., Inc.

The suburban increase in office construction is due not to BART, but to increasing population of the outlying areas and to factors such as the cost of land and zoning that make the suburbs attractive. Only two suburban buildings were identified that might have located in different parts of the Bay Area had BART not been built. No buildings were found to have been induced by BART to locate in the suburbs rather than in a central city.

As Figure 6-1 clearly shows, the established city centers (San Francisco and Oakland) have not captured a larger share of new office construction in the post-BART period. Interviews with representatives of six new offices moving or recently moved to San Francisco or Oakland indicated that the moves were unrelated to BART. None of the 53 informants interviewed were able to identify any office buildings built in San Francisco that would have been located elsewhere without BART.

However, BART has affected office construction at the local level. This impact is especially pronounced in downtown San Francisco, where office construction has flourished since the early 1960s. Most of the new office buildings in San Francisco's business district have located within five blocks of a BART station. Although new office space in San Francisco has been at greater densities than older buildings, this does not represent a BART effect, but rather increased demand.

According to key informants, BART has influenced the location of seven major projects in San Francisco since 1965, and has contributed to a redirection of new office buildings within the City. Figures 6-2 and 6-3 illustrate the tendency for new buildings to locate in the Market Street and south of Market areas. Formerly relatively undesirable, this area has experienced a dramatic rise in its share of the downtown's new office construction (dollar value), from none before BART to about 25 percent during BART's planning, to 50 percent during the construction period, and 88 percent after transbay service began. The shift in new office construction toward Market Street has not been accompanied by a corresponding increase in office alterations and additions. In fact, the dollar value of alterations and additions within two blocks of a downtown BART station, expressed as a share of citywide totals, has decreased since 1960.

BART's role in this shift has been indirect. First, BART gave impetus to a massive, $35 million beautification program for Market Street, the Market Street Development Project. The project has successfully landscaped, redesigned and rebuilt the streets and sidewalks, contributing greatly to the general upgrading of Market Street and undoubtedly affecting the willingness of developers to locate new offices there.

BART's second indirect effect was that BART engendered a study that gave rise to new zoning regulations for the downtown. Adopted in 1966, the new regulations granted bonuses in allowable floor area to buildings locating within 750 feet of a BART station or providing direct underground station access. Also, new offices within two or three blocks of Market Street were exempt from parking requirements.

These two influences combined with other factors — constraints on development in other directions, access to other transportation, the availability and low cost of land — to encourage new office construction in the Market and south of Market area. Without BART, a similar redirection probably would have occurred; however, BART has most likely caused the change to proceed more rapidly.[3]

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3. This conclusion is based on interviews with key informants and deductions about BART's effect on location decisions along Market Street.

Downtown San Francisco is the only place where BART has contributed to a major change in the character of its station areas. Since the Market Street Development Project began, Market Street has been transformed from a fringe area to an accepted part of the financial district, with comparable tenants and rents. Street beautification and landscaping associated with BART also occurred in three other parts of the system, but thus far the improvements have not engendered any further development of the station areas.

In Oakland, it was hoped that BART would provide an economic stimulus to the downtown. Three of the City's eight BART stations are situated in the downtown area. The Oakland Redevelopment Agency, anticipating stations to serve the downtown City Center, initiated the City Center Project in 1965. Inclusion of the 12th Street BART station in the project boundaries was a key factor in securing federal funds for the project.

Since BART began operation, there has been a significant increase in the share of new office construction (dollar value) near two of the downtown Oakland BART stations (12th Street and 19th Street), and a decrease in the share of alterations and additions. Although the amount of development is small in comparison to that in San Francisco, it represented as much as 60 to 80 percent of Oakland's total in the 1970s. New development in Oakland has not been at substantially greater density than older developments, and tenants of new space are not different from previous downtown Oakland office tenants.

Office construction in Walnut Creek also has shifted considerably toward the BART station. In 1972 a 10-story office building (Walnut Creek Plaza) was constructed near the station. This building, constructed in anticipation of the BART system, was completed prior to the opening of service. It represents the highest density office space built in Walnut Creek and the only high-rise in its vicinity. Demand for this new space was limited, resulting in a high vacancy rate for several years. By 1977, nine other new office buildings valued between $100,000 and $800,000 had been built within one-third mile of the station. The share of Walnut Creek's office construction near the BART station has risen from about 15 percent in the early 1960s to about a third of the total value of the City's total in the mid-1970s. [4]

Two other communities, Richmond and Berkeley, experienced increased office construction near their BART stations, but the overall amount of new office construction was small, and one or two buildings dominated City totals. In both communities no trend in upgrading office space near BART stations was evident. Other communities on the BART line have not experienced notable changes in office location patterns. In San Francisco's Mission District, BART's

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[4] The shift may have been influenced by other factors in addition to BART (for example, good highway access, vacant available land, and zoning).

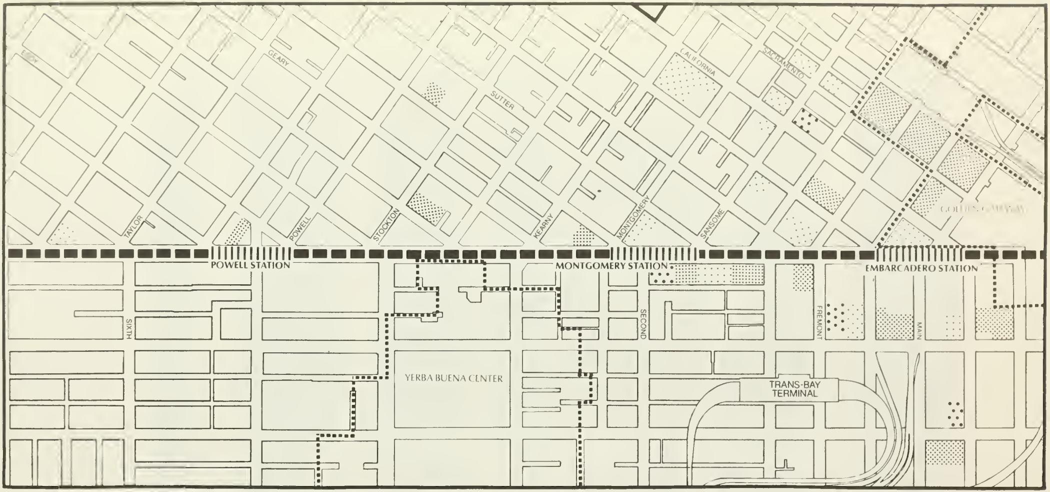


Figure 6-2. LOCATION OF MAJOR OFFICE BUILDINGS IN DOWNTOWN SAN FRANCISCO
(Date Building Permit Issued)

☐	January 1960–October 1962 (Prior to BART Referendum)
░	November 1962 – June 1967 (BART Planning)
▒	July 1967 – September 1974 (BART Construction)
▓	October 1974 – April 1977 (BART Operation)
Source:	San Francisco Central Permit Bureau

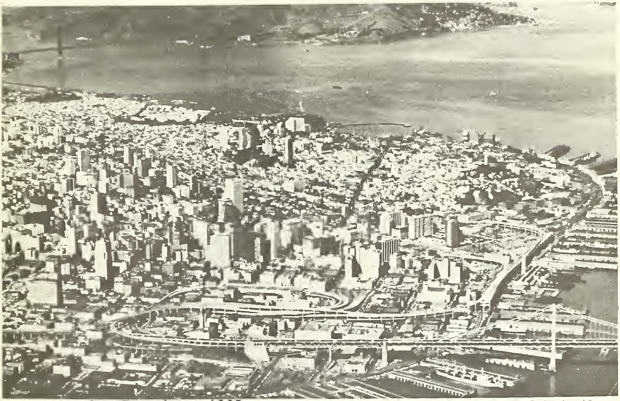
LEGEND

┈┈┈	Redevelopment Project
	BART
‖‖‖	Station Platform
■■■	Subway Line

North

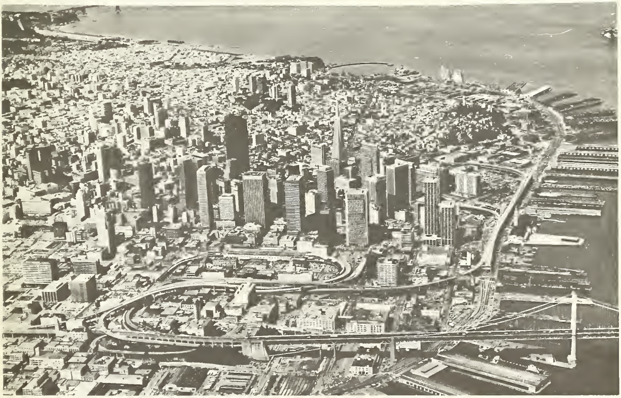
0′ 250′ 500′ 750′

FIGURE 6-3.



Downtown San Francisco: 1965

Pacific Aerial Surveys



Downtown San Francisco: 1976

Pacific Aerial Surveys

publicity coupled with specific station redevelopment proposals rallied neighborhood opposition to large office development. As a result, more restrictive zoning was adopted, and new office construction in the Mission District station areas has effectively been precluded.

Effects on Construction of Retail Space

BART has not yet influenced the locations of retail establishments in the Bay Area. Access to customers is critical in the location of a retail business, and transportation facilities consistently rank among the first considerations in site selection. But despite the importance of transportation, interviews with individuals whose retail and service businesses are located in BART station areas showed BART to be almost completely disregarded as a decision factor.

No major retailer in urban areas has located a new store in response to BART. Within San Francisco, retailers felt bus access was more important than BART access, while in suburban communities, automobile access was deemed significantly more important than BART access. However, BART station proximity had some influence on the siting of a store across from the Walnut Creek station, and BART was considered a minor factor in Montgomery Wards' decision to build a store at the Fremont Fashion Center, located near the Fremont BART station. Although the regional shopping center component of the Oakland city center will not go ahead until freeway access is guaranteed, BART will have an indirect effect, in that the use of BART construction cost "credits" made expansion of the redevelopment area possible.

HOUSING DEVELOPMENT DECISIONS

Methodology

BART's effects on the housing industry were examined in nine areas (see Figure 6-4). Several of these areas, including the Mission District, Fruitvale, East Oakland, and Richmond, represent older urban neighborhoods with a mix of single family and rental housing where BART might have provided an incentive for more intensive residential development. Daly City-Pacifica, Walnut Creek, Fremont-Union City, Hayward, and Pittsburg-Antioch are suburban communities where BART's effects on construction in outlying areas was examined. The characteristics of the study areas are summarized in Table 6-1.

Research hypotheses were analyzed using two complementary methods. First, building permit records, journey to work census data, bank loans for residential rehabilitation, aerial photographs of development activity, and 1976 BART Passenger Profile Survey data were analyzed to identify baseline conditions and current trends in the Bay Area housing industry, and to isolate changes potentially attributable to BART. Second, key informant interviews, both formal

FIGURE 6-4. HOUSING INDUSTRY STUDY AREAS

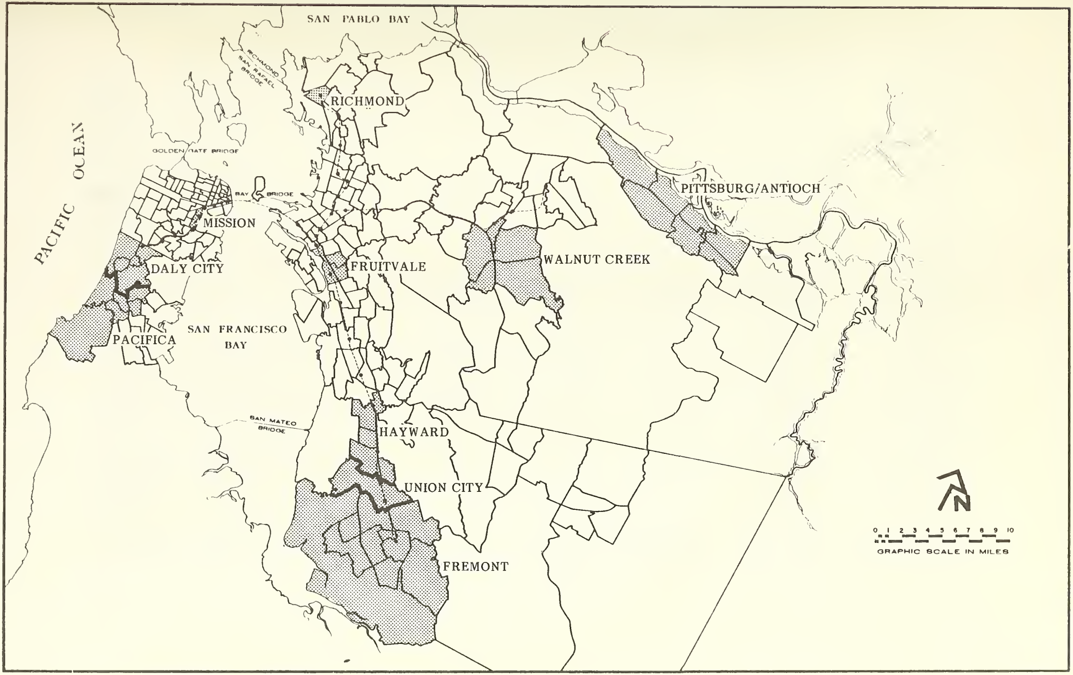


TABLE 6-1. HOUSING INDUSTRY STUDY AREAS: RESIDENTIAL LAND USE AND DEVELOPMENT OPPORTUNITIES, 1975

Outlying Communities	Housing Units	Residential Acreage	Density (HUs/acre)	Developable Acreage	Percent of Total Acreage
Daly City	27,016	1,863	14.5	160	2.4
Pacifica	23,542	2,969	7.9	3,843	28.7
Subtotal — Northern Peninsula	50,558	4,832	10.5	4,003	20.1
Hayward	18,094	2,439	7.4	794	10.9
Union City	8,632	1,756	4.9	424	6.7
Fremont	41,714	6,373	6.5	5,818	9.6
Subtotal — Southern East Bay	68,440	10,568	6.2	7,036	9.3
Walnut Creek	24,155	3,753	7.4	2,981	13.8
Pittsburg/Antioch	22,766	3,388	6.7	5,303	21.9
Urban Residential Areas					
Mission District (San Francisco)	13,087	176	74.4	-0-	—
Richmond	5,254	506	10.4	-0-	—
Fruitvale (Oakland)	16,204	1,050	15.4	-0-	—

Source: Association of Bay Area Governments, Series III Projections, 1977 questionnaires and open-ended discussion, were conducted to confirm and explain the findings of the quantitative analysis. Persons interviewed included developers, local public officials, building inspectors, planners, apartment managers, and others closely associated with the housing industry. All told, over 90 interviews were conducted.[5]

Effects in Outlying Communities

BART has not affected new housing construction at a regional scale, but it has influenced residential development in two corridors along the Concord line and the Fremont line and in the outlying communities of Pittsburg and Antioch. To arrive at this conclusion involved analysis of accessibility changes, building permit trends, passenger profile data, and key informant interviews.

Housing industry analyses were conducted in those study areas exhibiting the greatest improvement in transit accessibility to downtown San Francisco and Oakland (Hayward, Union City-Fremont, Walnut Creek, Pittsburg-Antioch, and Daly City-Pacifica). Only in Fremont-Union City and Pittsburg-Antioch did the annual share of suburban residential construction (number of units authorized in Alameda, Contra Costa, and San Mateo Counties, excluding Oakland), show a statistically significant increase from 1962 to 1977. In the Fremont-Union City study area the proportion of suburban housing authorized in the three counties rose from an annual average of 7.5 percent (1962-66) to 14.3 percent (1967-72) and 11.7 percent (1973-77). In Pittsburg-Antioch the increase was more dramatic, with the share of suburban housing constructed in that market area increasing almost fourfold from an annual average of 2.4 percent (1962-66) to 4.8 percent (1967-72) and to 8.6 percent (1973-77). In each of the other suburban communities studied the overall trend has been downward. Table 6-2 shows the trend computed for each community, treating construction of single family housing and multi-family housing separately.

BART may be only one of a number of factors affecting a community's share of housing construction in the region. Land cost and availability, environmental regulations, and community image all affect local construction trends. As less land is available for development, a community's share of regional construction understandably should decline. This explains the long-term trends in Daly City, Hayward, and Walnut Creek. However, in Fremont-Union City, Pacifica, and Pittsburg-Antioch much of the buildable land remains undeveloped according to ABAG's 1976 Vacant Land Survey (see Table 6-1). Can the differences in these communities be explained by growth attributable to BART, or were they simply in the path of urban expansion so that an increasing share of residential development was inevitable with or without BART? To answer this, first BART's potential impact on housing demand was analyzed, and then developers were interviewed to determine their perceptions of BART's effects on investment decisions and construction trends.

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[5] For a complete, technical discussion of the research objectives, methodology, and findings, see John Blayney Associates/David M. Dornbusch & Co., Inc., **Study of the Housing Industry** (Berkeley: Metropolitan Transportation Commission, September 1977).

TABLE 6-2. TRENDS IN THE DISTRIBUTION OF RESIDENTIAL CONSTRUCTION IN SELECTED SUBURBAN AREAS, 1962-77 (Percent Share of Permits Authorized in Alameda, Contra Costa, and San Mateo Counties, excluding Oakland)

	Single Family	Multi-Family	Total
Daly City-Pacifica			
1962-66	6.5	5.9	6.2
1967-72	6.7	3.6	5.4
1973-77	3.6	8.6	4.9
Average Annual Change	-0.2	0.2	-0.1
Fremont-Union City			
1962-66	12.0	3.0	7.5
1967-72	17.5	11.7*	14.3*
1973-77	13.2	9.0*	11.7*
Average Annual Change	0.1	0.6	0.4
Hayward			
1962-66	1.4	6.8	4.1
1967-72	1.9	4.5	2.9
1973-77	2.2	5.9	3.2
Average Annual Change	0.1	-0.2	-0.1
Pittsburg/Antioch			
1962-66	2.7	2.0	2.4
1967-72	6.6*	2.7	4.8*
1973-77	9.6*	5.0	8.6*
Average Annual Change	0.7	0.4	0.6
Walnut Creek			
1962-66	4.1	8.3	6.2
1967-72	4.2	9.0	6.5
1973-77	3.7	8.4	4.9
Average Annual Change	-0.03	-0.03	-0.1
Balance San Mateo County			
1962-66	16.6	31.9	23.7
1967-72	12.8	24.7	18.6
1973-77	15.3	28.2	18.8
Average Annual Change	-0.2	-0.2	-0.4

*Significant increase over 1962-66 period at the 95 percent confidence level based on a one-tail t-test.

Source: John Blayney Associates, Security Pacific Bank Construction Reports

MTC's 1976 BART Passenger Profile Survey indicates that about 2,500 persons are using BART for work trips who did not make the same trip before the beginning of BART service. Because many of these people formerly may have lived or worked outside the BART service area, it may be inferred that fewer than 2,500 persons specifically have changed residence or job location since service began in order to ride BART to work. While this figure may be taken as an upper limit of direct BART impact on residential moving and location decisions, it does not account for decisions by developers to proceed that may have been based in part on better access with BART. Nor does it account for householders' decisions to buy or rent based on the availability of housing at BART-served locations, or the notion that they might want to use BART. Retired householders or those looking toward retirement may have found the potential freedom from dependence on the automobile attractive.

Interviews with developers and apartment managers confirmed that BART has influenced demand in the study areas, but has not been a paramount factor in growth. Market demand and land availability are by far the two most important factors in development decisions; proximity to transportation and BART in particular are judged less critical. However, BART has affected locational and timing decisions on at least six major projects representing 3,500 units, approximately 10 percent of the 1965-78 volume of housing built in the BART corridors by those developers interviewed (see Table 6-3). Among those interviewed, several indicated that BART had been a positive influence on sales, including five developers operating in Pittsburg or Antioch, five in Fremont, three in Walnut Creek, and one in Daly City.

Correlating these findings with the building permit analysis suggests that BART, at least in the Fremont-Union City and Pittsburg-Antioch housing markets, has caused a net increase in the amount of new housing over what would have been built in the absence of BART, but central Contra Costa County (Walnut Creek) and Daly City-Pacifica housing construction volumes have not been measurably affected. In terms of housing types, BART has affected decisions on both single family and multi-family projects, as Table 6-3 clearly illustrates. In sum, BART has been a contributing factor in Bay Area suburbanization, affecting both supply and demand to varying degrees. However, at a regional scale, BART should be viewed as a relatively unimportant factor in the housing industry at large, mainly affecting timing and location decisions.

Effects in BART Station Areas

Two aspects of housing were studied for BART's impacts in station areas. First, BART's role in residential rehabilitation in station areas was evaluated; and second, BART's influence on the density of new development was determined. Little substantive evidence was obtained either from analysis of home improvement loans or key informant interviews that BART has positively affected

TABLE 6-3. RESIDENTIAL PROJECTS SIGNIFICANTLY INFLUENCED BY BART

Project	Location	Type	Number of Units	When Constructed	Nature of BART Impact
Diablo Keys	Walnut Creek	Apartments, all types $255-$600/month	788	1970-72	Deliberately located near BART, and timed to coincide with BART opening.
Bancroft Village	Walnut Creek	Townhouses, $77,000-$87,000	400	1976-79	Timing advanced one year.
Ranchos Medanos	Pittsburg	Single Family detached, $44,000-$57,000	900	1976-80	Location, timing, and density affected.
Stoneridge	Walnut Creek	Apartments, 1 and 2 bedroom, $240-$335/month	339	1970	Initial location and subsequent demand attributable to BART, at least in part.
Anonymous	Fremont BART line	Luxury apartments	300-400	1978+	Location and character heavily dependent on BART.
The Hub	Fremont	Condominiums, $60,000-$80,000	712	1978+	Location and density geared to a BART market.

Source: John Blayney Associates

rehabilitation activity in neighborhoods adjoining BART stations. Differences between activity in minority and non-minority neighborhoods could not be tested in the study areas because all neighborhoods that both adjoin BART stations and are candidates for signficant rehabilitation activity also are at least one-third minority. Thus, opportunities for comparisons between minority and non-minority neighborhoods were not available.

Bank disclosure statements of home improvement loan activity for 1975-76 indicated that bank-financed rehabilitation activity in San Francisco's Mission District, Richmond, and the Fruitvale district of Oakland was greater in census tracts that are **not** near BART stations. One potential explanation for this is that station area owners are taking a "wait and see" attitude, deferring property investment actions until BART's effects become clearer. Some of this may be occurring, but further investigation in the Mission District identified several other causes of greater rehabilitation at some distance from the BART stations.

The best publicized rehabilitation activity in the Mission District has focused on Noe Valley and Castro Street, located one mile west of the BART stations. Relatively affluent households unable to obtain suitable housing in more expensive areas of San Francisco have been displacing lower income groups that formerly occupied these neighborhoods. As higher income enclaves have formed, ever greater numbers of affluent households have moved in and rehabilitated Victorian structures. Since Noe Valley and Castro Street are not adjacent to BART and accessibility gains are small, the above trends cannot be termed BART-related — an interpretation confirmed by the key informant interviews.

Another reason for less station area housing rehabilitation in the Mission is that station area census tracts have a smaller percentage of single family homes than non-station area census tracts -- 7 percent vs. 16 percent to the east of the station and 31 percent to the west. Rehabilitation is more attractive to owner occupants than to apartment investors who would be unlikely to realize an attractive return on a higher investment unless the neighborhood character were to change so drastically that different tenants could be attracted at much higher rents.

In summary, analysis of home improvement loan activity and key informant interviews suggests that close proximity to BART is not viewed as a sufficient incentive for owners of older, possibly deteriorating housing to renovate their buildings in order to cater to BART riders.

BART has not had a marked effect on station area construction, although decisions on a number of projects have been influenced by the perceived benefits of a station area location. Among the study areas, only the South Hayward, Walnut Creek, and Fremont BART stations offer the opportunity to measure changes in residential densities within walking distance. Pacifica and Pittsburg-Antioch do not have BART stations, and Union City has not experienced residential development within normal walking distance. Fruitvale, Daly City, Richmond, the Mission District, East Oakland, and Hayward have experienced a few isolated instances of residential construction, none of which can be said to represent higher densities as a result of BART.

Although approximately one-third of key informants stated that BART has had an effect both on station area and non-station area residential densities, there have been few projects built that could be considered within the station area (within 1,500 feet). Two Walnut Creek projects considered to be at higher density than they would have been in BART's absence are over one-half mile from the station. Fremont has established a minimum density residential zone by the BART station (minimum allowable density is 50 dwelling units per acre, maximum is 70). Although there is now a condominium project being designed for the station vicinity (the Hub), to date developers have not felt housing of that density was viable in Fremont.

Other station areas that have been specifically zoned for intense residential development (though not necessarily so intense as to be economically infeasible) include Bay Fair, San Leandro, Concord, and Pleasant Hill, and to a lesser extent Walnut Creek, South Hayward, Richmond, and MacArthur. (Only Fremont has set a minimum density floor below which new development will not be permitted.)

On the other side of the coin, some cities explicitly have prohibited high density development. BART station areas that have been downzoned include El Cerrito Plaza, North Berkeley, Central Berkeley, Rockridge, and 24th Street in the Mission District (though not all changes were intended to lower residential density).[6]

A number of other factors are working against high density development in BART station vicinities: (1) Local opposition to townhouse and apartment development is precluding higher density development along the Concord line from Orinda outward.[7] (2) Land speculators may be demanding unrealistically high prices for vacant parcels near BART stations, such that even intense development cannot be justified in terms of the developers' profit margins. (3) Regardless of land prices, a sufficient market may not exist for high density residential projects in suburban locations currently zoned for such development. Developers can offer greater amenity at lower density for the same price. (4) When nearly every household has at least one automobile, rapid transit can no longer have the nucleating effects that it did when people needed to live within walking distance of transit. Apartment dwellers in outlying areas are likely to have as high or higher ratio of cars to employed household members as occupants of single family homes. (5) Too little attention has been given to the complementary facilities required to serve high density residential development adjacent to stations, e.g., the need for complementary commercial services. (6) Environmental restrictions are severe in some station vicinities. The Fremont BART station, for example, is near an earthquake fault. (7) Finally, outlying station areas themselves are not that attractive for residential development because of the ambiance created by the large BART parking lots and related traffic congestion.

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[6] For details on the Rockridge rezoning, see Jefferson Associates, Inc., **Impacts of BART on Bay Area Political Institutions** (Berkeley: Metropolitan Transportation Commission, May 1977), pp. 9-20.

[7] Dennis Dingemans, **Residential Subcentering and Urban Sprawl: The Location of Higher Density, Owner-Occupied Housing Around the Concord Line BART Stations** (Berkeley: Institute of Urban and Regional Development, April 1977), p. 33.

Everything considered, BART has not induced significant increases in residential densities within walking distance of BART stations.

Effects in BART Service Corridors

The adverse environmental effects of BART, mainly train noise, have discouraged residential development along the Fremont line, but these impacts are limited to a narrow seven-mile zone adjacent to at-grade and elevated BART tracks where BART noise exceeds community noise levels.[8]

All available evidence indicates that BART-generated sound is a factor that influences developers of housing. Problems arising from BART noise have a number of facets. For instance, the Federal Housing Administration (FHA) resists insuring home loans in noise-impacted areas. This caused at least one developer to decide against buying a parcel of land near BART elevated trackage where BART-generated noise exceeds community noise levels. Also, builders are faced with a myriad of regulations in noise-impacted areas. California law requires that new multi-family structures within a 60 dB noise exposure contour must have special noise insulation to reduce interior sound levels to 45 dB. The developer is required to engage a noise consultant to assure attainment of an acceptable interior sound level. Additionally, since 1972 California has required cities and counties to adopt a noise element as part of their general plan. According to one developer interviewed, standards adopted by local jurisdictions usually can be met for noise from roadways by building a high barrier wall. However, a noise barrier wall for elevated BART trackage is not feasible.

Compliance efforts can be costly. They range from fees paid to noise consultants, to costs incurred during delays for project reviews, to total writeoffs if a project is not approved. Therefore, developers are reluctant to become involved with properties in areas where BART noise creates impacts.

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[8] For details on BART's noise impacts, see Gruen Associates, Inc., **Environmental Impacts of BART** (Berkeley: Metropolitan Transportation Commission, August 1977), pp. IV-21 to IV-26.

There is evidence of this reluctance in Union City and Fremont near the BART line. The two cities have grown at a rate that would cause pressure for residential development near the BART line, where there are some parcels available for development. However, no residential development has occurred there. Representatives of four developers interviewed confirmed that their development decisions had been influenced by the potential noise impacts of BART. Most of them knew of property owners who had problems selling their land because of BART's noise.

Some residential developers have tended to build near BART in response to attitudes and expectations generated by BART planning and publicity, but most have not. For the most part, those influenced by BART were responding to pronouncements that BART would increase housing demand, and in our interviews these people indicated a willingness to pay a $500 to $5,000 per unit premium to build near BART, even though such increased costs apparently are not justified in today's market. Two notable examples recently built near the Walnut Creek BART station are the 800-unit Diablo Keys project and the 340-unit Stoneridge Apartments. Both of these were designed to appeal to young couples and single people working in San Francisco. As an indication of the developers' reliance on this market, delays in starting transbay BART service to San Francisco contributed to slow rent-up.

PUBLIC AGENCY DEVELOPMENT DECISIONS

Methodology

Regional and city plans, as well as key informant interviews with representatives of government agencies, provided information for analysis of BART's effects on public projects.

Effects on Public Projects

BART has affected both public development and redevelopment projects. Transit access is a major site selection criterion for state and federal offices, and BART influenced development decisions in San Francisco and Richmond. In Fremont, locational decisions for the Alameda County courthouse and the California Schools for the Blind and Deaf, both located beyond 1,500 feet of the BART station, reportedly were influenced by BART.

Some public development occurred in conjunction with redevelopment projects made possible by use of BART construction funds as part of the local contribution (an "in lieu of cash" credit) for redevelopment. The Social Security Administration's decision to locate in Richmond was tied to provision of an adequate site through redevelopment (as well as BART access), and the Laney College site in Oakland was cleared through redevelopment relying on use of BART Lake Merritt station construction costs as in-lieu local share. As public projects often spur associated private development, clustering of public projects in station areas can help encourage private development projects.

Currently, BART is exploring the feasibility of a joint development project at Lake Merritt station to provide office space for its own needs and those of other regional agencies in a "government center". Tentative plans call for a 100,000-125,000-square-foot building to be constructed on the BART parking lot southeast of BART headquarters. Patron parking would be provided in the building itself.

CONCLUSIONS AND IMPLICATIONS

BART's impacts on office construction have been primarily indirect, through influencing redevelopment and beautification projects and inspiring zoning changes. These factors have had considerable influence on new office construction at the local level, even though the provision of BART service itself appears to have had negligible impact. Thus, it seems fair to advise other cities that, at least in terms of office construction, their new transit systems' most important impacts may be indirect and difficult to forecast.

An important lesson learned from the Bay Area's experience with BART is not to overestimate a new transit system's importance in promoting office development in an area already well served by local and regional transit systems. BART has not induced any new office centers to appear and, in fact, some new office concentrations continue to develop in apparent disregard of BART (e.g., the northeast waterfront in San Francisco; Kaiser Headquarters in Oakland; and Ygnacio Valley in Walnut Creek). Thus, BART clearly has not proven to be a sufficient condition to produce new office patterns, and neither does it, at this point, appear to be a necessary condition. Other cities must not expect a new transit system alone to solve development problems unless they are caused solely by correctable transportation deficiencies.

BART's lack of effect can be explained by the way developers view transportation facilities in their location decisions. Lack of commuter accessibility can serve to disqualify a site from consideration, but once accessibility is satisfactory, the increased accessibility provided by a new transit system is only a "plus", not a factor important enough to overcome market considerations such as land prices and proximity to the established business district.

BART's construction significantly augmented the capacity of transportation links to downtown San Francisco. Without BART, lower capacity may have inhibited growth in downtown San Francisco. Whenever growth in San Francisco reaches a point at which commuter trips exceed the pre-BART capacity of transportation links to San Francisco, it can be said that BART is having some causal effect on San Francisco's office location decisions. Until then, BART will continue to be just one minor factor among many factors considered in the decision making process.

Other cities probably can expect their new transit systems to have a similarly delayed effect. If the system is well-planned to sustain an existing business district, in the long run it can reinforce developers' market judgments and enable an area to thrive longer than otherwise possible.

A city wishing to redirect growth in office space can also draw upon the Bay Area's experience. Attempts by three Bay Area cities to influence the location of new office buildings have demonstrated that public policy incentives (such as zoning and redevelopment) can effectively influence developers' decisions only when market forces are also favorable. In San Francisco, zoning inducements and a beautification program acted in conjunction with strong demand for office space, inexpensive land, large parcels, and a location adjacent to the expanding financial district to redirect office growth toward the BART corridor. In contrast, Oakland and Richmond both have created redevelopment areas near their respective BART stations, but in both cases market forces have not been favorable and, as a consequence, neither redevelopment area has been able to attract as much development as was hoped.

The BART experience also has shown that to encourage desired changes in land use a transit system must be planned from the beginning in cooperation with city officials in positions to set accommodative public policy, and with developers themselves, who actually decide where to place new buildings and are most familiar with market forces. Transit improvements made without this cooperation likely will not succeed in influencing the location of new office buildings.

BART's effects on the housing industry suggest the following policy implications. First, rail rapid transit by itself will not cause residential development to cluster around suburban stations. Supportive land use policy is necessary. More important, if communities desire development, they should negotiate zoning and other conditions of approval with developers to make transit-oriented development feasible from an economic standpoint. As examples, relaxing parking space requirements and sharing costs for pedestrianways to facilitate station access represent two possible concessions that might lower a developer's costs sufficiently to make a station area project viable.

Second, high density zoning intended to encourage private redevelopment and intensification of use in residential neighborhoods rarely creates sufficient incentives for transit-oriented development when market forces do not make it economically feasible. Such policies probably should be limited to areas of substantial housing deterioration and blight. But even in these cases, well-funded neighborhood conservation programs or public redevelopment may be preferred, and should be justified on the basis of social, economic, and environmental policies and objectives, not just as a transit-supporting land use policy.

Third, planners and decision makers should not expect any transit-oriented development, even under optimistic assumptions, until after construction has begun. Most developers will wait for the opening of service. In anticipation of this, opportunities for cooperative land use planning and development programming should be pursued during the early planning and design stages.

Fourth, the impacts of train noise should be reflected in local land use and zoning policies by establishing buffer zones along at-grade and aerial trackways through residential areas, or requiring installation of barriers or other mitigation measures. Routes through nonresidential areas or within shared rights of way should be favored from a land use planning perspective. In fact, given the increased awareness of noise today and the requirements of environmental review and noise abatement legislation, noise impacts are likely to be scrutinized far more carefully in future transit planning than they were during the initial BART planning and design.

Finally, because rail transit may affect corridor development trends to some extent, local communities should be encouraged to adopt growth management strategies to avoid school impaction or overloaded public services and facilities resulting from unanticipated increases in housing construction. Although this was not an impact specifically attributed to BART in any of the communities studied, it could become an issue elsewhere, particularly if service began in a strong housing market. (BART's opening of service coincided with the 1973-74 recession which significantly depressed housing construction.)

Transit station development can have a strong effect on government agency location and development decisions. Consistency of public policy should dictate that local, regional, and other government agencies give transit access major consideration.

While the use of transit construction expenditures as an in-lieu local share of redevelopment provided the funding to expand several redevelopment projects in Richmond and Oakland, the elimination of the old federal urban renewal program and its replacement by the Community Development Block Grant mechanism will preclude future use of transit expenditures in this manner.

7. MARKET EFFECTS

INTRODUCTION

BART's influence was expected to extend to several important facets of the Bay Area's economy. It was reasoned that the amenity of BART service would place a premium on land near BART stations, and that speculation would occur in anticipation of that increase in property prices. The stations would function as nodes of activity, and stores nearby would benefit from the increased foot traffic generated by the station.

Whether or not these impacts materialized was investigated by the following three studies. The specific questions addressed were:

— Has speculation related to BART occurred in any station areas? If it has, when and to what extent did it occur?

— Have retail sales of stores near BART stations grown more rapidly than sales of stores farther away? Are individuals altering their shopping patterns because of BART? Have the location decisions of merchants been influenced by BART?

— Have property prices and rents increased unusually near BART stations? Has the change been related to BART?

BART's market effects are the best indicators of revealed preferences, the extent to which people actually value BART's services or are affected by its nuisances, such as train noise, visual intrusion and parking lot overflow. Some even expected these market effects to be so dramatic that they might provide a convenient source of financing, taxing the value created by the public improvement to pay for it (value capture). These studies provide empirical evidence that gains attributable to BART are small and consequently would not make a major contribution toward meeting capital costs.

A caveat is in order. Neither the Land Use Project nor the BART Impact Program set out to conduct a cost-benefit analysis, and these market impact studies should not be viewed with that objective in mind.

SPECULATION

Methodology

Speculation was defined in this study as the buying and/or holding of real property in expectation of profiting from changes in its market price not directly resulting from investment in the property itself. The definition excludes investment for multiple purposes, even if one of those purposes is speculation. The shortcoming of this exclusion was overcome by combining informants' knowledge of speculation with empirical analyses of data which do not distinguish simple and multiple purpose actions but are indicative of speculative motives.

Eight BART station areas were examined for evidence of speculation. Forty-one interviews were conducted with real estate specialists and city and county planning officials, and data were gathered on factors that might indicate speculative activity, such as property turnover, owner occupancy, rezoning requests, and use conversions. BART's role in any observed speculative activity was determined through the interviews and by examining the speculation indicators at various distances from the BART stations.[1]

BART's Effects on Speculation

Some type of BART-induced speculation was found at five of the eight areas studied. In addition, informants indicated that there had been some speculative activity in other suburban station areas, particularly those in eastern and central Contra Costa County. Figure 7-1 indicates the locations where speculation was thought to have occurred, and Table 7-1 summarizes the supporting evidence for the eight station areas that were studied in detail.

Although speculative activity occurred in several station areas, in no instance did it involve large-scale purchase or holding of land. Most speculation was in small commercial and residential properties. Nowhere has speculation been pronounced enough to cause noticeable impacts on land use in terms of intermittent land uses or vacant lots.

Most speculation occurred in the 1960s during the period of station construction, when expectations about BART were at their highest. Soon thereafter, speculative activity declined and eventually vanished in all locations except Richmond, where some activity may still be occurring. Indications are that anticipated profits generally have not been realized from BART-related speculation.

The level and type of speculations varied considerably from community to community. For example, according to the evidence compiled, downtown San Francisco experienced no speculative activity, while downtown Oakland had speculation in both commercial land and office buildings. Speculation occurred in the suburban areas along the BART line in eastern and central Contra Costa County, but not in equally suburban southern Alameda County. Exact explanations for the

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[1] Distances studied ranged from 300 to 2,500 feet. For a complete, technical discussion of research objectives, methodology, and findings, see John Blayney Associates/David M. Dornbusch & Company, Inc., **Study of Property Acquisition and Occupancy: BART's Effects on Speculation** (Berkeley: Metropolitan Transportation Commission, April 1978).

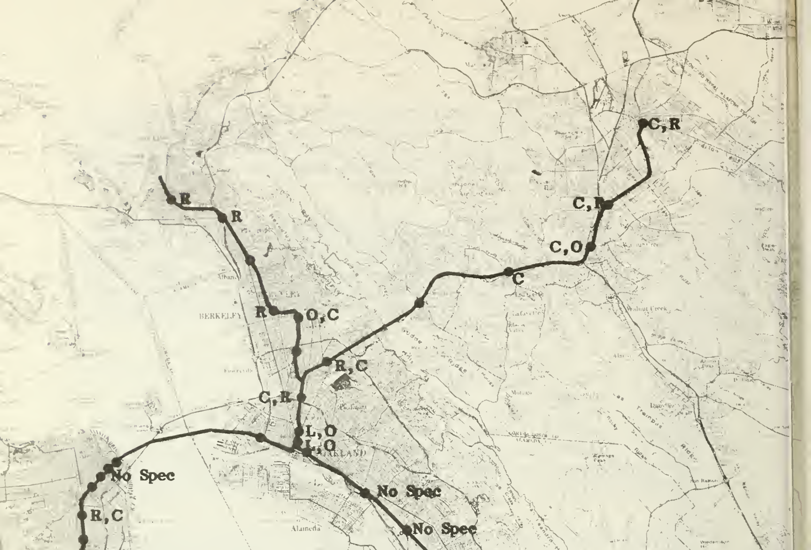

Fig. 7-1. **BART-Induced Speculation**

L = Speculation in Land
O = Speculation in Office Buildings
C = Speculation in Other Commercial Buildings
R = Speculation in Residential Buildings
No Spec = No Evidence of Speculation

TABLE 7-1. INDICATORS OF SPECULATION ATTRIBUTABLE TO BART

Station Area	Increase in Real Estate Sales	Decrease in Homeowner Exemptions[a]	Increase in Requests for Variance	Increase in Land Use Changes	Judgment of Key Informants[b]
24th and Mission (SF)	0	0	+	+	5 yes 1 no
Powell Street (SF)	0	0	0	0	3 no
Richmond	0	+	0	+[c]	3 yes[d] 4 no
19th Street (Oakland)	0	0	0	0	5 yes 1 no
Fruitvale (Oakland)	0	0	0	+	4 no
Rockridge (Oakland)	0	+	0	0	4 yes
Fremont	0	0	0	0	1 yes 5 no
Walnut Creek	0	0	0	+	3 yes 1 no

Plus (+) indicates that there was a significant difference nearer the BART station; zero (0) indicates no measurable difference.

a. Californians who live in residences they own are allowed exemptions on a portion of the assessments of their homes. A decrease in the number of homeowner exemptions claimed in a neighborhood implies an increase in the number of housing units being rented or other changes in the property's status which may indicate speculation.

b. Key informants' responses are presented here with the implication that equal weight was given to each. Only in cases where an informant was especially knowledgeable (or ignorant) in the subject were different "weights" given to their judgments in the analysis.

c. Caused by redevelopment rather than by BART.

d. One informant "presumed" there was speculation due to BART.

Source: David M. Dornbusch & Company, Inc.

differences are unknown. They may involve the coincidence of "ripeness" for development with BART construction, orientation of communities toward either San Francisco or, to a lesser extent, San Jose (not served by BART), or the varying land-use controls in effect at each location. The most likely reason for the absence of speculation in downtown San Francisco is that long-term interests have outbid speculative interests for available property.

RETAIL SALES AND SHOPPING PATTERNS

Methodology

BART's effects on shopping trips and shopping habits were examined through a shopper survey administered to 499 shoppers in six shopping areas served by BART. The survey focused on the shopper's current shopping trip, his or her overall shopping pattern, and demographic characteristics. The survey sample was selected to contain about half BART riders, and respondents were screened for length of residence and for people who were on errands or shopping trips. The sample cannot be considered representative of the entire BART service area population. This sampling frame enabled a comparison of BART riders and nonriders. An unweighted sample would have been unlikely to have contained a sufficient number of BART riders to make those analyses. Since the BART-rider portion of the sample did not differ from the other shoppers surveyed in terms of race, income or education, the findings of BART's effects presented here may be indicative of similar effects among the regional population.

In addition to the survey, 27 retailers and eight others knowledgeable about retail sales activity were interviewed. Forty relevant interviews from other BART Impact Program projects also were reviewed. The interviews were used to ascertain retailers' opinions of BART's effects on their businesses, and BART's influence on their location decisions.

Sales tax data from 17 shopping areas in the BART service area were analyzed. Regression equations were estimated to test whether proximity to BART was associated with growing sales volumes.[2]

BART's Effects on Shopping Patterns

Over the past two decades, a major shift in the distribution of retail sales has occurred in the Bay Area. More and more stores are opening in the suburbs, forsaking traditional downtown areas to be nearer their customers. (See Figure 7-2.)

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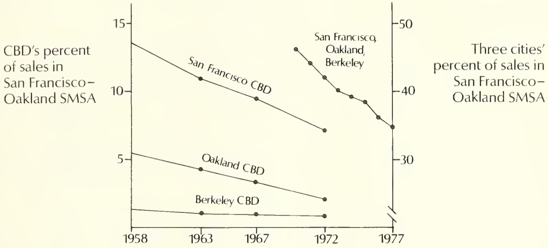
[2] For a complete, technical discussion of research objectives, methodology and findings, see John Blayney Associates/David M. Dornbusch & Company, Inc., **Study of Retail Sales and Services** (Berkeley: Metropolitan Transportation Commission, April 1978). A description of the data is found in Louis P. Bucklin, **BART-II, Part IV, Impact on Retail Sales** (Berkeley: University of California Institute of Urban and Regional Development, 1973).

FIGURE 7-2. CHANGE IN CENTRAL CITIES' SHARE OF REGIONAL RETAIL SALES, 1958-77



The project investigated whether BART has played a role in this trend, perhaps by inducing people to shop more often in the downtown or suburban areas it serves. The 1977 Shopper Survey asked respondents why they had increased their use of particular BART-served areas. As Figure 7-3 illustrates, BART was an important factor for a quarter of the 177 respondents who had increased their patronage during the last three years. While BART riders did not show a greater frequency of shopping area patronage than did non-riders, BART's influence extends to the transportation-deprived segment of the population. Equal frequency of shopping trips here may represent a positive impact on persons without access to their own vehicle.

Evidence from the survey indicates a possible shift in shopping patterns, favoring downtown San Francisco, downtown Oakland, and Walnut Creek. In all three locations shoppers who had begun to use the area since 1974 showed a significantly higher propensity to use BART than did others. The differences are presented in Table 7-2.

FIGURE 7-3. REASONS FOR INCREASING USE OF SHOPPING AREA

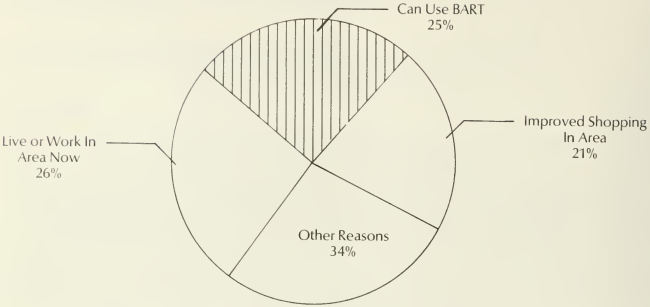


TABLE 7-2. PROPENSITY TO RIDE BART FOR SHOPPING. NEW VERSUS LONG-TERM SHOPPERS.

Shopping Area	Percent New Shoppers Using BART	Percent of Long-Term Shoppers Using BART	Difference Significant at .05 Level
San Francisco	73	60	Yes
Oakland	67	52	Yes
Walnut Creek	69	29	Yes

Sample Size: new shoppers - San Francisco = 7, Oakland = 12, Walnut Creek = 17; long-term shoppers - San Francisco = 73, Oakland = 74, Walnut Creek = 63; approximately half the respondents were BART riders.

Source: David M. Dornbusch & Co., Inc., 1977 Shopper Survey

Among those surveyed in these three areas, not only were new shoppers more likely to be BART riders, they also frequently cited BART as the reason for beginning to shop there. This is especially true for San Francisco and Walnut Creek, as Figure 7-4 shows, where more than 40 percent of the new shoppers surveyed claimed that BART was the reason they had begun to patronize the area. As more and more new shoppers appear, BART's impact may grow. Further monitoring could determine whether or not these observations do indeed represent a trend in shopping patterns.

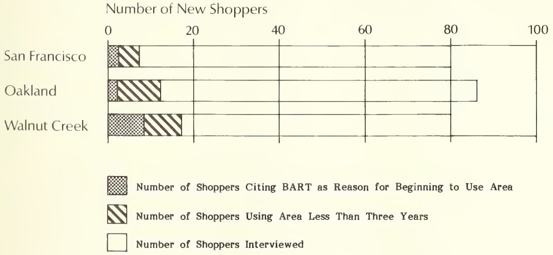


FIGURE 7-4. BART'S INFLUENCE ON NEW SHOPPERS

The survey results showed that BART is more commonly utilized for personal errands (doctor's appointments, banking) than for shopping, and used more frequently in shopping for household items, gifts, and personal items than for groceries, furniture or appliances. The implication is that firms selling bulky products are least likely to benefit from BART patronage; those selling small items are most likely to benefit.[3]

BART was found to provide shopping transportation more commonly for people without access to private vehicles than for others, and for long-distance commuters as opposed to other individuals. The sample showed no difference in BART use for shopping according to race, income, or education.

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[3] Although appliances and furniture are usually delivered to the home, store managers indicated that buyers tend to comparison-shop for such items, preferring the flexibility of their own automobile.

BART's Effect on Retail Sales

BART's effects on retail sales are not entirely clear. Some merchants near BART (six of 33) felt that proximity to the stations has enhanced their sales; the others felt BART had no effect. Two of the stores claiming that BART was beneficial had their own entrances to BART stations. About half of the merchants interviewed, however, mention BART in their advertising.

Regression analyses of retail sales from 1970 to 1976 showed no evidence of a positive BART effect. In only one instance was a clear effect shown (for the downtowns of Oakland, Berkeley, and San Francisco) and there the effect was negative. Declines during these years may reflect (a) losses related to BART construction or (b) continuation of previous declining trends for stores in the near-BART areas.

PROPERTY PRICES AND RENTS

Methodology

This study employed a before-after multiple regression technique. Explanatory models were developed for changes in property prices and rents before, during, and after BART's construction in 12 different station areas. Besides proximity to BART stations and tracks, variables in the estimated models included characteristics of the site (e.g., parking and proximity to freeways, schools, and parks) and of the building itself (such as age, height, tenancy). The technique was applied to both residential and commercial properties.[4]

Constant dollar changes in residential and commercial prices and rents were studied through multiple regression analyses at 10 different station areas, several of which served as multiple study sites; thus, altogether 27 regression analyses were performed. The model specification varied only with respect to the inclusion of non-BART variables assumed a priori to have influenced the change in prices and rents. This model postulated BART's impacts as an inversely diminishing function of distance from either the station or the tracks. The model worked satisfactorily in all instances except for the 16th Street-Mission station area in San Francisco, where no systematic variation in price or rent changes (at least in terms of the model) could be detected.

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4. The accuracy of the regression models at the sample means measured by the coefficient of variation varied from four to 30 percent, but typically was nine to 11 percent. This accuracy decreases nonlinearly for estimates further from the sample means.

The station areas chosen as sites exhibited a wide diversity of characteristics as to housing type, price, and mixture with commercial uses. For example, Walnut Creek is a relatively new, higher priced residential suburb with commercial development around the BART station, while the Glen Park and El Cerrito stations are in older residential areas with local business districts nearby. The residential areas of the Mission are not of significantly greater density, but are liberally mixed with both commercial and industrial uses. Moving to the extreme, station areas in downtown Oakland and San Francisco are entirely commercial with a wide range of rents and prices. Yet, the methodology used was able systematically to distinguish BART's effects on property price and rent changes.[5]

BART's Effects on Residential Property Prices and Rents

Residential property prices were analyzed at six station areas (El Cerrito Plaza, Glen Park, Mission and 16th Street, Mission and 24th Street, South Hayward and Walnut Creek). In three of these locations distinct BART impacts were found to have occurred during the period preceding BART service, when expectations about the system were high. Proximity to those BART stations had a small but significant positive effect on the prices of single family dwellings. The effect diminished rapidly with increasing distance to the stations, and at 1,000 feet the BART influence on prices was 0 to 4 percent, as illustrated in Figures 7-5 and 7-6. (One area could not be evaluated due to econometric problems encountered at the study site.)[6] In no case did the BART effect extend beyond 5,000 feet.

In later years, BART's effects on residential property prices became less clear. In one station area where parking and traffic problems emerged (Walnut Creek), BART's effect became negative. Another station area (Glen Park) evidenced a long-term positive BART effect on residential property prices. There, property prices rose throughout the neighborhood 5 percent more than prices in the surrounding area. Key informants attribute this increase to BART's improvement of transit access. The Diamond Heights redevelopment project north of the station may have been a contributing factor. BART also had a positive impact on property prices in South Hayward from construction to the present period (see Figure 7-7). At 1,000 feet from the station the influence was estimated to be approximately an 8 percent increase in price.

Residential rents were not expected to be sensitive to the anticipation of long-term benefits. Therefore, our analyses investigated rent changes from the pre-

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[5] For a complete, technical discussion of research objectives, methodology, and findings, see John Blayney Associates/David M. Dornbusch & Company, Inc., **Study of Property Prices and Rents** (Berkeley: Metropolitan Transportation Commission, July 1978).

[6] At the 16th Street-Mission station site, there was excessive random variation in the data in terms of the model specified.

CHANGE IN RESIDENTIAL PROPERTY PRICES
AS A FUNCTION OF DISTANCE TO A BART STATION

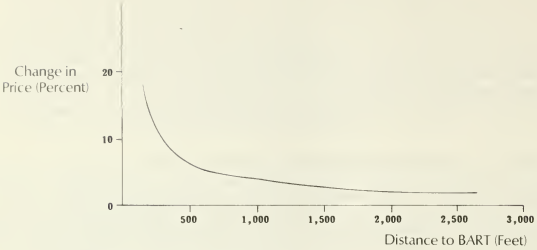

Figure 7-5. Glen Park–Impact Before Service

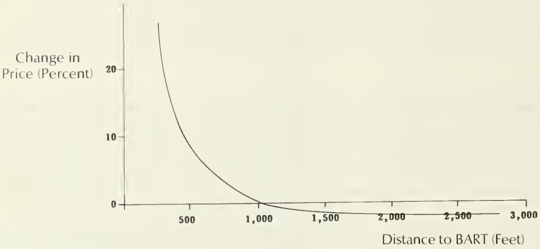

Figure 7-6. Mission & 24th Street–Impact Before Service

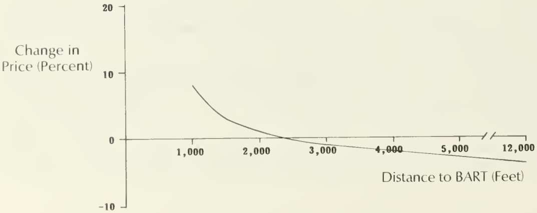

Figure 7-7. South Hayward–Impact After Service

BART period to the present, but not anticipation effects, in two locations. Two locations were studied. In the Mission District, no BART effect was detected. In Walnut Creek, we found evidence that proximity to the BART station is becoming a positive effect on residential rents, and proximity to the tracks a negative, though smaller, influence. Although these effects are in the expected direction, they are not now strong enough to enable rejection of the hypothesis of no BART influence. While in neither location could rents be confidently associated with distance to BART, in the Walnut Creek study area as a whole residential rents were found to have risen more than elsewhere in the Bay Area. This increase may be partially due to improved accessibility as a result of BART.

BART's Effects on Commercial Property Prices and Rents

Changes in office rents were examined in three locations (downtown San Francisco, Oakland, and Walnut Creek). In each case BART was found to have exerted a small, positive influence on rents. The estimated influences on rents are shown in Figures 7-8, 7-9, and 7-10. In San Francisco the BART effect disappears beyond 100 feet from the station, and in both San Francisco and Oakland BART influences office rents in conjunction with other important factors (proximity to San Francisco's Market Street or Oakland's City Center Project). In both cities the positive BART influence has occurred in a context of decreasing rents in relation to building costs. In Walnut Creek the BART effect has appeared only since transbay service began in 1974. Here BART proximity is somewhat collinear with building height, but their joint effect is positive.

Only one area, the Mission District, yielded enough data for statistical analyses of changes in commercial property prices. The available evidence, including key informant opinions and the results from the residential analyses, indicate that BART had some positive impact on commercial property in the Mission. The effect (estimated at slightly over one percent at a distance of 500 feet). is illustrated in Figure 7-11. BART's influence occurred when anticipations about BART were still high, and has since disappeared.

Table 7-3 summarizes the timing, location, and nature of BART's impacts on property prices and rents.

In sum, BART appears to have had a positive effect on property prices before service began, reflecting anticipated BART benefits. Since then, the impact on property prices has largely disappeared, except in South Hayward. The expected negative influence of proximity to the BART tracks is statistically insignificant and/or considerably smaller than the positive effect of proximity to a station.

Residential rents have not been affected at all by BART. Office rents, however, show a positive impact at all study sites and there are some indications that this effect is growing stronger. That office rents show a more consistent impact than either residential prices or rents probably reflects the fact that work loca-

CHANGE IN OFFICE RENTS AND COMMERCIAL PROPERTY PRICES
AS A FUNCTION OF DISTANCE TO A BART STATION

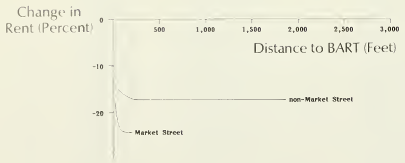

Figure 7-8. Downtown San Francisco Office Rents–
Impact After Service

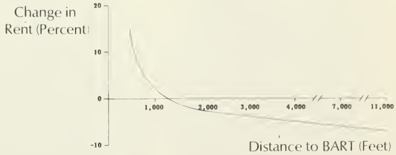

Figure 7-9. Downtown Oakland Office Rents–
Impact After Service

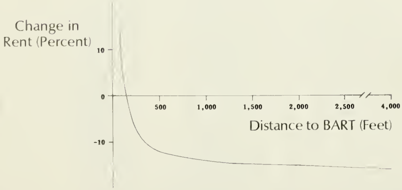

Figure 7-10. Walnut Creek Office Rents–Impact After Service

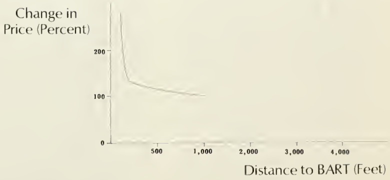

Figure 7-11. Mission District Commercial Property Prices–
Impact Before Service

Note: The 'O" represents average increase in property price for the submarket, and negative values mean that the price change was below the average.

Source: David M. Dornbusch & Co., Inc.

TABLE 7-3. SUMMARY OF BART'S PROPERTY VALUE AND RENT IMPACTS

Station Area	BART Station Impact			BART Track Impact		
	Before Service	After Service	Long Term	Before Service	After Service	Long Term
Residential Property Prices:						
El Cerrito Plaza	0	0	0	0	0	0
Glen Park	+	0	(+)[a]	tracks underground		
Mission/16th Street	indeterminate			tracks underground		
Mission/24th Street	+	0	0	tracks underground		
South Hayward		+			0	
Walnut Creek	+	-	-	-	-	-
Residential Rents:						
Mission		0		tracks underground		
Walnut Creek		0			0	
Office Rents:						
San Francisco		+		tracks underground		
Oakland		+		tracks underground		
Walnut Creek		+[b]		not thought to affect office rents		
Commercial Property Prices:						
Mission	+	0	0	tracks underground		

Plus (+) indicates a significant, positive difference nearer the BART station; minus (-) indicates a negative effect relative to the average price changes in the submarket; and zero (0) no statistically significant difference at a 95 percent confidence level.

a. Areawide effect only.

b. Only after transbay service began.

Source: David M. Dornbusch & Co., Inc.

tions have traditionally been more sensitive to mass transit access than residential neighborhoods, which, especially in the suburbs, are auto-oriented.

CONCLUSIONS AND POLICY IMPLICATIONS

The finding that some speculation occurred around many BART stations should not unduly alarm officials in other cities planning similar transit projects. For one thing, speculation is not always detrimental to the land market and may promote more efficient development over the long run. Moreover, no large-scale speculation was detected. And although speculation can be expected whenever major transportation improvements create expectations of increased development, those expectations depend upon both substantial improvement in access and an existing demand for new residential or commercial space. Finally, knowledge of BART's relatively small impact on land use and the absence of profit from BART-related speculation may tend to dampen expectations in other cities and reduce speculation.

Cities hoping a new transit system will aid in the revitalization of their older downtown retail districts will find some support from this study, but the effect to date in San Francisco and Oakland has been minor. Only about 20 percent of the informants reported any BART effect on sales, and a third of these stores had a direct entrance to the BART station. Analysis of retail sales patterns from 1970 through 1976 failed to show that proximity to BART positively influenced growth in sales, but survey results suggest that BART may affect shopping patterns more strongly in the future.

The reasons that stores do not view BART as an important factor in their location decisions may apply equally to fixed-rail transit systems outside the Bay Area. Although we found transportation access a vital factor in stores' location decisions, urban stores located so as to gain access to bus service, while the suburban stores located near good automobile access. BART was not considered very important by either group. Other cities with highly developed bus sytems are likely to experience the same result.

A design different from the present BART system might go further toward increasing property prices and rents. Notably the current problems of overflowing parking and increased automobile traffic in some station areas would have to be solved — perhaps by eliminating some lots in favor of extensive feeder bus systems which operate as part of a normal local bus system (as in Europe). This may not, however, be an acceptable approach in this country. Zoning and other regulations would also have to encourage or at least allow development which can capitalize fully on BART amenities. Typically this would mean higher densities near the station areas.

The property price and rent increases detected by this study are relatively so small that a value capture system to redeem the benefits created by public action would not be worth the effort. Value capture as a means of financing transit systems would have to be part of the initial design in order to reach proportions worth consideration.

8. REGIONAL EFFECTS

INTRODUCTION

BART's regional effects were examined with two objectives: one, to analyze BART's direct and indirect effects on development patterns, focusing on changes in the spatial distribution of population, employment, housing and urban development; and two, to determine whether minorities have been helped or hurt more than other socioeconomic groups. Using land use and urban development trends in the Bay Area over the past 15 years, the relative magnitude and importance of BART's effects were evaluated at several scales of analysis, ranging from selected station areas to corridor segments, cities, the BART service area, and the nine-county Bay region.

This analysis focused on the following questions:

- Is "white flight" a continuing phenomenon, and how, if at all, is BART contributing to it?
- Has BART had any effect on the residential location of minority populations?
- How and to what extent has BART affected employment opportunities?
- What role has BART played in expanding employment opportunities for minorities compared to non-minorities?
- How does the housing stock removed by BART construction compare to the housing induced by BART? Where was the loss, and where was the gain?
- Has BART-induced redevelopment had an adverse effect on minorities?
- What are the patterns and rates of land development in the Bay Area?
- To what extent is BART influencing development on prime agricultural land, environmentally sensitive land, and on seismically unsafe land?

The answers to these questions provide a reasonable gauge of BART's effects on development patterns and its ability to affect urban form at a regional scale.

METHODOLOGY

Various analysis techniques were used to study BART's regional effects. To identify areawide effects, changes in distributions of housing, population, and employment were analyzed statistically, using data files for 1970 and 1975 maintained by MTC for the Projective Land Use Model (PLUM). These data are organized by traffic zones which are somewhat larger than census tracts. The study area -- Alameda, Contra Costa, San Francisco, and northern San Mateo Counties -- included 239 analysis zones. Further statistical tests were conducted with information from the 1977 MTC Workplace Survey and the 1976 BART Passenger Profile Survey, both for areawide and subarea analyses.

Other analysis techniques included analyses of land use changes between 1965 and 1977 for 18 BART stations -- seven downtown stations, seven urban stations, and four suburban stations. Special census data collected in Contra Costa County, Fremont, and Union City in 1974 and 1975 also proved useful. Finally, key informant interviews were conducted with officials, realtors, developers, bankers, and community representatives to complement the quantitative analysis, dealing particularly with BART's impacts on minorities.[1]

EFFECTS ON POPULATION

No statistically significant relationship was found between 1970-75 population change and accessibility improvements with BART at a zonal level of analysis. However, correlating BART accessibility gains to San Francisco and population increase in suburban Contra Costa and southern Alameda County cities suggested a positive relationship (see Table 8-2). While BART has not been responsible for decisions on whether to move, it has affected community or neighborhood choice among movers to or within suburban communities. Analysis of BART's importance in residence choice among Walnut Creek movers indicated that approximately 32 percent felt BART was a major consideration in their choice of a location. Interestingly, there was no significant difference between those who had moved from a central city in the Bay Area and those who had moved within Walnut Creek or from another suburban community (see Table 8-1). While this does not indicate whether BART contributed to "white flight", it suggests that a small proportion of those who were influenced by BART in their residence choice in fact did move from inner city to suburban locations.

The evidence regarding whether BART has affected moves of white households to a greater degree than minority households is somewhat contradictory. Minority respondents to the Household Survey were less interested in BART than their white counterparts, but this is largely related to their residential location in the Mission District where BART had little effect on minority or non-minority movers. A stronger relationship was found between black suburbanization and BART accessibility than for white suburbanization and BART accessibility. This was attributed to large increases in black population between 1970 and 1975 in communities served by the Richmond and Fremont BART lines. Further analysis showed a higher BART usage among black household heads living in Fremont than among white household heads there (see Table 8-3). This is not

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[1] For a complete, technical discussion, see John Blayney Associates/David M. Dornbusch & Co., Inc., **Study of Development Patterns** (Berkeley: Metropolitan Transportation Commission, June 1978).

TABLE 8-1. BART IMPORTANCE IN RESIDENCE CHOICE IN WALNUT CREEK: INNER CITY MOVERS VS. OTHERS

Former Residence	Total Respondents	Percent Considering BART of Major Importance in Residence Choice
Inner City Movers**	20	30.0
Other Movers	153	32.0*
Total	173	31.8 (avg.)

*No significant difference at the 0.95 level.

**Moved from San Francisco, Oakland, Berkeley, or Richmond.

Source: John Blayney Associates/Tyler Research Associates, 1977 Household Survey

a result of higher propensity to use BART among blacks in Fremont per se, but a differing central city orientation. While 15 percent of white Fremont heads of households worked in San Francisco, Oakland, or Berkeley in 1974 (the work locations for which a Fremont resident is most likely to use BART for commuting), almost 26 percent of black heads of households worked in those communities.

In conclusion, to the degree that a higher proportion of the minority population lives in central cities, it is less affected by BART in location decisions. But once a minority household decides to move to a more suburban community, BART may become a more important criterion because of greater central city work orientation.

EFFECTS ON EMPLOYMENT

BART apparently has not influenced employment growth significantly. In multiple regression analysis, the key variable in explaining variations in employment growth among zones between 1970 and 1975 was distance to the closest central business district (CBD), and the interrelationship between BART stations and

TABLE 8-2. POPULATION CHANGE 1975 TO 1970 AND NBA/BART ACCESSIBILITY IMPROVEMENT TO DOWNTOWN SAN FRANCISCO AND OAKLAND

	Ratio of Population Change 1975/1970*			Ratio of BART/NBA Travel Times**	
City	Total	White	Black	San Francisco	Oakland
Antioch	1.18	1.16	4.74	.94	1.01
Pittsburg	1.06	1.04	1.03	.94	1.02
Concord	1.10	1.09	2.70	1.28	1.55
Martinez	1.07	1.05	1.41	1.29	1.00
Walnut Creek	1.16	1.15	2.76	1.18	1.31
Orinda	.98	.98	.97	.89	.97
Pinole	1.01	.95	2.03	1.12	1.52
El Sobrante	.84	.81	2.12	1.14	1.87
Richmond	.86	.93	.80	.89	1.25
El Cerrito	.91	.85	1.23	1.20	1.23
Fremont	1.14	1.10	4.07	1.97	1.91
Union City	2.04	1.89	8.29	1.85	1.75
Correlation Coefficient Population Change/Accessibility Improvement to:					
— San Francisco	.63	.59	.68		
— Oakland	.28	.23	.48		

Sources:

* U.S. Census and 1974-75 Special Census is for Contra Costa County, Fremont and Union City.

**Comparison of peak-hour network times in minutes.

CBDs prevented separation of the BART effects from these other influences. Although employment growth in the City of San Francisco has been less than for the region, as Table 8-4 indicates, employment in the San Francisco CBD has grown faster than in the nine-county Bay Area, a fairly unusual phenomenon in American cities in recent years.

Employment growth related to BART, as well as to redevelopment and zoning policies, has been greater in the older central cities of San Francisco and Oakland than in suburban areas such as Walnut Creek, Hayward, or Fremont. As reported

TABLE 8-3. BART USAGE BY ETHNIC STATUS, WORK TRIPS OF FREMONT HEADS OF HOUSEHOLDS

Ethnic Status	Total Respondents	Percent Using BART as Primary Mode
White	28,678	3.4
Spanish Heritage	1,970	1.9
Black	471	5.7
Asian	795	4.7

Source: Fremont Special Census, 1974

in Chapter 6, the location of over three million square feet of new office space was influenced by BART in San Francisco and Oakland, affecting job locations for over 12,000 persons. The only other major buildings located in response to BART were in Richmond (400,000 square foot Social Security Administration Center), Berkeley (135,000 square foot Great Western building), and Walnut Creek (135,000 square foot Walnut Creek Plaza building).

Some of the differential effect results from differing local zoning policies. Both San Francisco and Oakland modified their zoning to focus high-rise construction around the BART stations, with San Francisco giving a floor-area-ratio (FAR) bonus for locations near BART or with direct access to a station. No other city encouraged commercial development in station areas to the same degree.

BART's greatest accessibility gains are to suburban residents commuting to downtown San Francisco and Oakland jobs. While there is minority suburbanization occurring, most minority groups are underrepresented among those who gain the most from improved accessibility. BART does serve large minority communities in the Mission District, Richmond, and Oakland, but these areas are and have been served by competing bus transportation, and BART offers little improvement in service quality for most trips taken from these neighborhoods. There appears to be little reverse commuting on BART by inner city minority residents to jobs in suburban communities served by BART. The blue collar employment areas in Oakland, Richmond, and southern Alameda County are not convenient to BART stations, and swing-shift work schedules have also served to minimize the possibility of use of BART in commuting to such work places.

TABLE 8-4. EMPLOYMENT IN THE SAN FRANCISCO CBD AND NINE-COUNTY BAY AREA, 1960, 1965, 1970, AND 1975

Year	Number of Jobs: San Francisco CBD*	Number of Jobs: Nine-County Bay Area**	San Francisco CBD as Percent of Nine-County Bay Area
1960	115,000	1,452,400	7.9
1965	137,000	1,675,700	8.2
1970	169,000	1,985,400	8.5
1975	192,000	2,170,400	8.8
Percent Change, 1960 - 1970	47	37	
Percent Change, 1970 - 1975	13	9	

Note: Comparable data did not exist for Oakland.

Sources:

* Keyser Marston Associates estimate, in Impacts of Intensive High Rise Development on San Francisco, San Francisco Planning and Urban Renewal Association (SPUR), San Francisco, California, June 1975.

**California Employment Development Department

BART's greatest benefits to minority employees may be indirect. By being an influence on employers' decisions to remain in central city locations rather than to move to locations less accessible to inner city minority populations, BART has been beneficial to these persons although they may take the bus or drive to work.

EFFECTS ON HOUSING

Housing induced by BART has been largely built in suburban communities, while much of the housing removed by BART construction was primarily in older, closer-in areas. Approximately 2,300 units of housing were lost from the stock as a result of BART construction (some 700 units were relocated). Analysis of acquisition by corridor segment indicates that 58 percent of single family units bought by BART were in urban rather than suburban communities. (Suburban was defined as San Leandro and south on the Fremont line, and Orinda and east on the Concord line.) Also, 86 percent of multi-family units acquired were in urban areas.

Few major developers indicated that they were influenced by BART. Those who were (see Table 6-3) built in suburban communities, and most large-scale new housing development are located in suburban communities.

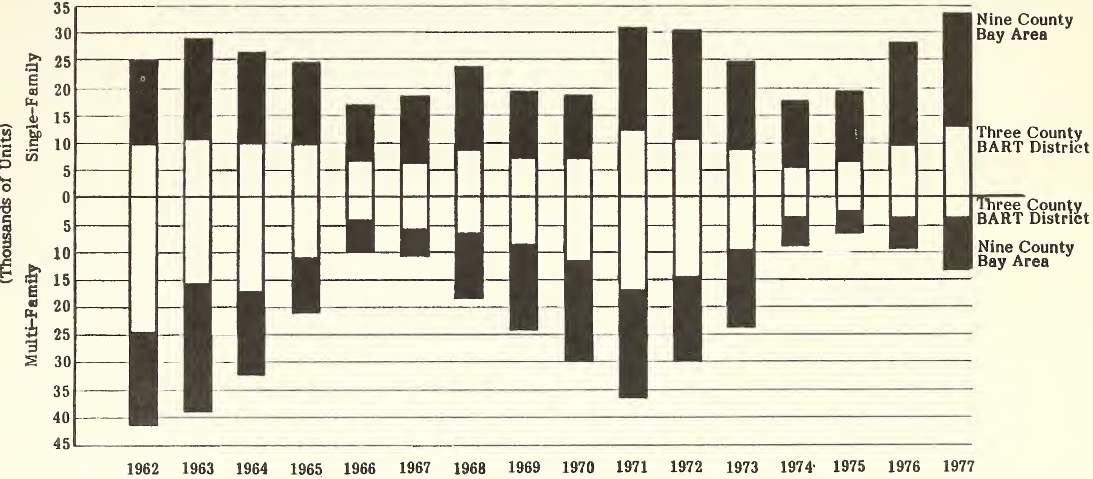
Regression analysis of trends in occupied dwelling units and BART accessibility indicated there was a significant positive relationship between the change in dwelling units in an analysis zone between 1970 and 1975 and accessibility to BART stations. Although this appears to contradict the results of the analysis of BART's effects on population growth, two points may clarify the differences. First, many new housing units are being purchased by dual worker households with no children, and consequently, the small household sizes are not showing up as substantially in population change as in housing unit change. Further, household formation has been much more dramatic in recent years, and new households are quite sensitive to their transportation options.

The housing development related to BART generally has occurred outside of immediate station areas. As Figure 8-1 illustrates, construction of multi-family units has fallen to a post-1960 low in the Bay Area since BART opened in 1972. As it is not economic to build single family homes on land previously developed, and most station areas were developed prior to BART, the lack of private development is not surprising, given the few multi-family units constructed anywhere in the Bay Area.

If BART served to encourage migration to suburban areas, with all other factors equal, one might expect decreased demand for inner city housing which could have several effects; among them allowing minorities and lower income households to occupy better housing than previously available, or increasing migration to the Bay Area by such households as a result of housing availability.

While previous findings indicated that BART has influenced some moves, there is a distinction that must be made between moves to suburban areas from Bay Area inner city areas, moves within suburban areas, and moves from outside the Bay Area. Among Walnut Creek respondents to the Household Survey, only 7 percent moved from San Francisco, 7 percent moved from urban and suburban locations in Alameda County, and 47 percent were movers within suburban Contra Costa County. The remaining movers came from either other Bay Area suburban counties or from outside the Bay Area. Consequently, BART's effect on suburban movers from inner cities was quite small. If demand had decreased for housing in inner city areas as a result of BART's influence on moving decisions,

FIGURE 8-1. BAY AREA SINGLE FAMILY AND MULTI-FAMILY HOUSING PERMITS, 1962-77



Source: Security Pacific Bank, Construction Reports.

vacancy rates would have increased and increases in property values would have been less pronounced. Between 1970 and 1974 vacancy rates did increase in San Francisco, Oakland, and Richmond in relation to suburban areas along BART lines, but these increases were not substantial, and in two of the three cases, vacancy rates came back down by 1977. Any loosening of the housing market in central cities because of household moves stimulated by BART has been offset by other trends, such as inflation, energy shortages, and an increased demand for city housing by middle to upper income white households -- the so-called move back to the city.

EFFECTS ON LAND USE

Previous work in the BART Impact Program established that BART has not increased three-county BART service area's share of growth at the expense of other Bay Area counties.[2] Growth continues to be fastest in Santa Clara County. Within the four corridors served, BART has affected both employment and residential location decisions, but effects on employment location are more apparent. BART's effects within station areas have been substantially greater on employment location decisions than on residential location decisions.

Several reasons explain why the majority of new development affected by BART in station areas consisted of commercial or institutional uses rather than housing. Possibly most important were the zoning incentives given to encourage commercial development in downtown San Francisco, Oakland, Richmond, and Walnut Creek (the incentives in Walnut Creek were eliminated after the Walnut Creek Plaza building was built). In contrast, eight station areas were downzoned, precluding substantial residential redevelopment. Although zoning in 10 non-CBD station areas does allow higher density housing than currently exists in the surrounding neighborhoods (Bay Fair, San Leandro, Concord, Pleasant Hill, Union City, Fremont, and to a lesser extent Walnut Creek, South Hayward, Richmond, and MacArthur), only Pleasant Hill, Union City, Fremont, and South Hayward have large vacant sites zoned for multi-family housing. The degree of intensification that is possible for residential redevelopment on currently occupied sites is not sufficient to justify the costs associated with acquisition and demolition of existing housing in comparison with construction on outlying vacant parcels. For example, in Walnut Creek until very recently land containing five units per acre and valued at approximately $500,000 per acre was zoned for a maximum of 20 units per acre. The intensification of only four times the units does not make private redevelopment economically feasible. A differential land cost of $200,000 an acre over vacant land and a density of 20 units per acre would translate to a $80-90 per month rent differential, more than tenants would be willing to pay for station area housing. In contrast, redevelopment of a downtown San Francisco site for office use may involve an intensification of 10 times and much higher rents per square foot in the new space. To date, no large-scale residential development has occurred on vacant land at the four stations where that is possible, although the Hub, a 712-unit condominium complex is slated for a site adjacent to the Fremont station.

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[2] For details, see the Land Use Modelling Project's report: Metropolitan Transportation Commission, **Stage I Findings and Stage II Implementation Plan** (Berkeley: July 1977).

A second explanation of the type of development in station areas is that while commercial uses affected by BART must be within walking distance of a station, housing in auto-oriented suburban areas with station parking lots does not need to be close to BART to be influenced (Diablo Keys, Stoneridge). Analysis of the Household Survey indicated no difference in importance of BART in the location decision whether the respondent was within a 10-minute walk or 10-minute drive of the station.

A number of other factors work against high density residential development in BART station vicinities: (1) Local opposition to non-suburban development patterns is precluding higher density development along the Concord line from Orinda outward. (2) Land speculators may be demanding unrealistically high prices for vacant parcels in proximity to BART stations, such that even intense development cannot be justified in terms of the developers' profit margins. (3) Regardless of land prices, a sufficient market may not exist for high density residential projects in suburban locations currently zoned for such development. Developers can offer greater amenity at lower density for the same price. (4) When nearly every household has at least one automobile, rapid transit can no longer have the nucleating effects that it did when people needed to live within walking distance of transit. Apartment dwellers in outlying areas are likely to have as high or higher ratio of cars to employed household members as occupants of single family homes. (5) Finally, outlying station areas themselves are not that attractive for residential development because of an unattractive ambiance created by the large BART parking lots and related traffic congestion -- a problem reflected in the negative property price impacts presented in Chapter 7.

A high proportion of residential development in Pittsburg-Antioch, Fremont-Union City, and Concord-Clayton has occurred on prime agricultural lands, and in fact, most of the coastal plains and interior valleys of the Bay Area consist of prime agricultural soils. Although development on prime agricultural lands was encouraged or possibly hastened on specific sites by anticipation of BART service, development of these lands probably was inevitable in the absence of strong legislation regulating the urbanization of prime agricultural lands. Little development indirectly influenced by BART has been on steep slopes or on seismically unsafe sites because governmental regulations effectively limit such development in California.

CONCLUSIONS AND POLICY IMPLICATIONS

A transit improvement such as BART will not particularly affect the rate of urban development within the service area. In the absence of strong economic demand in an area, a transit station will not cause development. A station may serve to shift the demands for office space or housing within a community and even a metropolitan area if those demands exist and incentives are offered for station area development.

BART will not change development patterns without accompanying and consistent policies from all levels of government. In order to have the regional effects anticipated, it would be necessary to institute much more supportive zoning and land use incentives and controls than has been the case in most communities served by BART. In some cases, communities have not favored BART-related development clusters, and other communities have been unable to direct new development into station areas. Density bonuses near stations, such as higher floor area ratios allowed near downtown San Francisco stations, or Fremont's minimum density residential zoning district adjoining the station, offer examples of necessary steps to encourage densities supportive of substantial pedestrian usage of stations.

Development is less attracted to sites near transit stations that primarily rely on park-and-ride patronage than it is to downtown station areas. Without coordinated and careful joint use planning, the size of the parking lots and traffic impacts create undesirable residential environments around park-and-ride stations. Successful joint use residential projects in station areas must consider noise and traffic impacts of the station, and be designed with these problems in mind.

Stations located in urban central business districts will serve to reinforce these areas more effectively than park-and-ride stations will reinforce suburban areas. The highly visible public commitment to the central cities is important to encourage private capital investment in these areas. The majority of new suburban development occurs on vacant land away from station areas; transit-induced demand rarely is sufficient in most suburban communities to justify station area redevelopment and intensification of use.

With current corridor land use policies BART will have more effect on employment location than housing, by allowing a greater flow of traffic through constrained corridors into employment centers, such as through the Caldecott Tunnel in the Berkeley Hills and across the Bay into San Francisco. With the large park-and-ride parking lots, suburban housing does not need to be near the station to be affected by BART, while office space at destination stations must be within walking distance as few persons are willing to transfer between modes near their destination.

9. CASE STUDIES

INTRODUCTION

The case studies presented in this chapter draw together information on all types of BART's impacts, not just those that are the focus of the Land Use and Urban Development Project, and thus represent the culmination of an effort involving all contractors in the BART Impact Program. The case studies were intended to provide an easily readable account of BART's impacts in three types of urban areas — urban core, urban residential and suburban — focusing on the following questions:

- What are BART's impacts on travel conditions, economic activity, land use, public policies and other aspects of life in the case study communities?
- Why do these impacts occur? Why did only some expected impacts occur? Why did others occur in unanticipated magnitudes, ways, or places?
- Who is affected by the impacts? Are impacts on minorities and the disadvantaged any different from those on other socioeconomic groups?
- What steps might have been taken or could be taken to mitigate adverse effects and maximize benefits attributable to BART?

The Program-Wide Case Studies were designed to complement the analysis of regional impacts, focusing on BART's impacts in a community context. The case study approach considered not only BART's direct and indirect impacts but also the role of local governments and land use and development policy in the impact process. In some cases, the development policies were clearly intended to encourage transit-related development, while in others fears of expected impacts led to adoption of policies to prohibit intensive station area development. The overriding objective of the case studies was to provide documentation of the BART experience in each study area, focusing on similarities and differences and their policy implications.

METHODOLOGY

Three types of case study areas were selected by the BART Impact Program staff and contractors, based on population and urban development characteristics, local public policy toward BART, the availability of critical data, and the nature and extent of BART's impacts. Downtown San Francisco and downtown Oakland were selected to represent urban core areas. The Rockridge neighborhood of north Oakland, the Mission District of San Francisco, and the area tributary to the Richmond BART station were chosen as typical inner city, urban residential areas with different concentrations of minority groups. Finally, the areas served by the Walnut Creek and Fremont BART stations were selected as representative suburban communities (see Figure 9-1).

Relevant social, economic, fiscal, environmental, and land use information was assembled as the basis for a profile of each area accompanied by a chronology of key development decisions related to BART. Station area land use and zoning for 1965 was mapped for each case study area, as were major 1965-77 land use changes and 1977 zoning. This summary of case study work can only highlight the issues examined; for details on technical matters or specific impact areas, the **Program-Wide Case Studies** report should be consulted.[1]

FINDINGS: AN OVERVIEW

In each of the case study areas BART has had an effect, but the differences are perhaps more pronounced than the similarities due to the economic and political environment in each community. Before addressing these, some commonalities are worth noting. First, BART's benefits have been less than expected, partially because it does not provide the level of service expected: reliability is poor, average train speeds are 80 percent of those originally planned (36 vs. 45 miles per hour), and peak hour train frequencies are six minutes, not 90 seconds. BART also did not cause downtown revitalization or clustered, high density housing around suburban stations. To its credit, BART's adverse environmental effects are minimal. It meets its original mandate to carry long distance commuters to central city workplaces. Shoppers also use BART, a benefit for downtown merchants who might otherwise have lost these customers to outlying shopping centers and other retail areas, and a loss to merchants in these outlying areas, except for department stores with outlets in both downtowns and the suburbs. Through planning and zoning actions, redevelopment projects, and capital improvement programs, some local communities have endeavored to capitalize on opportunities for coordinating development with construction and operation of BART. In some cases, the successes demonstrate the value of coordinated planning efforts to implement land use and transportation policies. In others, it still is too early to see BART's role clearly.

Because BART represented a major, long-term commitment of public resources, its effects are greater than would have occurred under the NBA. To name only three differences, transit ridership is higher, workplace and residence location decisions would have been less influenced by the NBA, and decisions on the

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[1] John Blayney Associates/David M. Dornbusch & Co., Inc., **Program-Wide Case Studies** (Berkeley: Metropolitan Transportation Commission, July 1978).

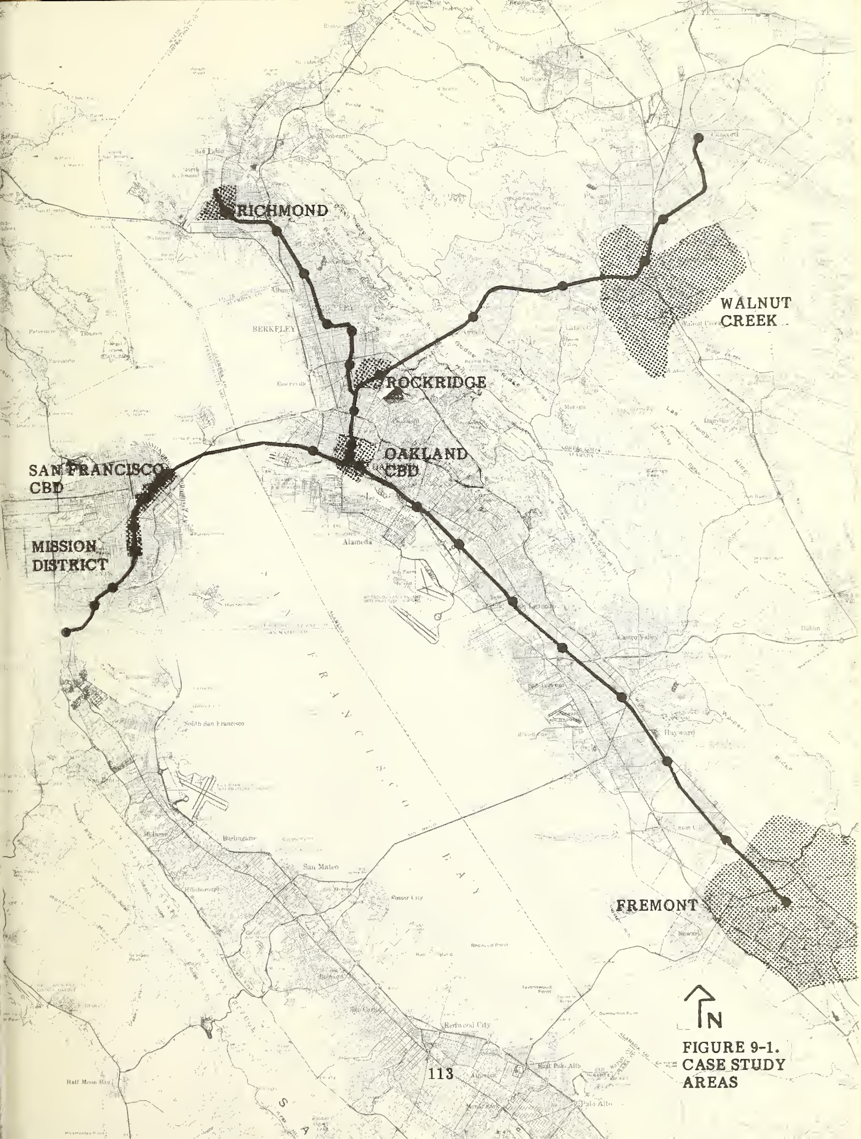

FIGURE 9-1. CASE STUDY AREAS

timing and location of several major office developments would not have been affected by the NBA because of the leverage BART provided local agencies, allowing them to undertake larger redevelopment projects and initiate capital improvement programs. But the case studies also illustrate that while BART cannot create markets where they do not exist; it can serve and enhance markets, and act as a catalyst for public and private decision making. On balance, the BART experience demonstrates that the urban form-giving potential of a rail rapid transit system exists, but is limited. The story of BART in each community should be read with this perspective on the overall level of impact in mind. The individual case study findings are presented in the following sections, treating separately urban core areas, urban residential areas, and suburban areas.

EFFECTS IN URBAN CORE AREAS

The original impetus for BART came in the early 1940s from national military concerns with the effects of traffic congestion on the ability of the Bay Area to produce war materials. In the late 1940s and 1950s concern about the effects of increasing highway congestion and suburbanization on the vitality of San Francisco as a business and retail center became more widespread. For example, one of the specific expected benefits of BART cited in the **1962 Composite Report** was that the system would lead to the "preservation and enhancement of urban centers and subcenters".[2] Oakland and Berkeley were expected to share in these benefits.

Downtown San Francisco — flanked by hills to the north and west, the Bay to the east, and an old manufacturing and warehouse district to the south — is the economic and cultural center of the region. Downtown Oakland is located 7.5 miles east of downtown San Francisco across San Francisco Bay. All BART lines go through the City, and Oakland is also well served by highways and bus transit.

Both San Francisco and Oakland have had a rapidly declining proportion of regional retail sales, and in fact retail sales unadjusted for inflation in downtown Oakland have been virtually static for close to 20 years. Both cities also have lost manufacturing and other industrial employment, while becoming more specialized financial and service centers. Downtown San Francisco, with 200,000 persons employed in comparison to 48,000 in downtown Oakland, remains the dominant commercial center for the Bay Area. Although office rents average $.20 a square foot per month higher in San Francisco, office demand remains stronger in San Francisco despite Oakland's location as the hub of the BART system.

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[2] Parsons, Brinckerhoff, Tudor, Bechtel, **Composite Report - Bay Area Rapid Transit** (1962), p. 82.

Downtown daily BART patronage of 49,100 trips in San Francisco and 13,800 trips in Oakland in March 1978 illustrates the relative use of BART in each city. While downtown San Francisco BART stations serve almost exclusively as destination stations, Oakland CBD stations are both destinations and origins for San Francisco-bound trips. In fact, patronage has been increasing at the downtown San Francisco stations at an average annual rate of 9 percent, while ridership at the downtown Oakland stations has remained relatively constant since transbay service began in 1974. Table 9-1 summarizes demographic characteristics and current BART patronage in each area.

Downtown San Francisco

Four BART stations were built in downtown San Francisco: the Embarcadero and Montgomery Street stations which serve the traditional and expanding business and finance area of the City, the Powell Street station which serves the Union Square central retail and tourist center, and the Civic Center station which serves the government/institutional center. The Embarcadero station at the foot of Market Street was not included in the original system design. In the early 1960s redevelopment had not yet extended the financial district to lower Market Street, so the need for a station there was not clear. The decision to build Embarcadero station was made in 1966 by the City of San Francisco. It was financed with tax increment bonds from the Golden Gateway redevelopment area adjoining the station. The Market Street BART facilities include a second-level subway for the planned Muni-Metro light rail line, which will permit the removal of surface-level streetcars. The Muni-Metro system is scheduled to begin operations in 1979.

Impacts on Planning and Zoning: San Francisco planning, zoning, redevelopment, and public improvement policies were combined to take maximum advantage of BART. In the 1950s, Market Street was a boundary of the prestige office area in downtown San Francisco. Buildings offering office space for lease were not built along Market Street or south of Market because locations within the established business district to the north were more attractive. The width of Market Street was a barrier; the manufacturing-wholesaling skid row district south of the street hurt its image; and the street was congested by streetcar and bus lines. Anticipations of BART service and the plans to replace the aboveground streetcar lines with a light rail system operating underground provided the impetus to improve the street.

Business and civic leaders organized a Market Street Development Project in 1962. This project culminated in a specific plan for Market Street and the downtown BART station areas in 1965, and later resulted in the $35 million Market Street Beautification Project. The beautification project included sidewalk widening and brick paving; the addition of trees and street furniture; and major plazas at the Embarcadero, Powell Street, and Civic Center BART stations. The refurbishment of Market Street changed its character. It is now an integral part of the financial district.

TABLE 9-1. SUMMARY STATISTICS FOR URBAN CORE STUDY AREAS*

	San Francisco	Oakland
Employment		
1965	188,800	48,200
1970	195,200	43,200
1975	196,100	48,000
Average Annual Growth Rate (Percent)	0.4	0.04
Resident Population		
1965	26,100	18,200
1970	23,500	14,500
1975	30,300	12,200
Annual Growth Rate (Percent)	1.5	3.9
1970 Residents' Demographic Characteristics		
Black (Percent)	4.8	25.0
Spanish Heritage (Percent)	7.8	9.4
Median Income (1969 Dollars)**	$ 8,600	$7,600
Average Daily BART Patronage: 1978		
San Francisco:		
Embarcadero Station	12,400	
Montgomery St. Station	17,500	
Powell St. Station	11,500	
Civic Center Station	7,700	
Oakland:		
12th St. Station		5,000
19th St. Station		5,700
Lake Merritt Station		3,100

* Statistics are for census tracts contiguous to the BART station. In San Francisco this area is approximately 4 mi x 1 mi; in Oakland, 2 mi x 1 mi.

** Median income of families and unrelated individuals.

Source: U.S. Census, Association of Bay Area Governments

In 1962, when BART was authorized, the planning and zoning regulations in San Francisco imposed no effective limits on the height or bulk of buildings. A series of actions beginning in 1964 laid the foundation for the shift in development to the Market Street area. BART was viewed as a critical factor in the process by a number of persons who were involved. In 1964, in response to pressure from citizens' groups for definitive downtown zoning, the allowable floor-to-building-area ratios (FAR) were reduced; that is, the allowable height of buildings in relation to the total area was reduced. In 1966 a Downtown Zoning Study was begun which led to the adoption of a 20 percent FAR bonus for buildings with a direct connection to BART. A smaller (up to 10 percent) FAR bonus was made available for buildings located within 750 feet of a BART station. In addition, the 1968 zoning provisions shifted the highest density allowances to the Market Street transit corridor. In 1971 the height and bulk units were changed; the greatest height (700 feet) was permitted only in an eight-block area surrounding the Montgomery Street BART station. The differences are illustrated on the pre-BART and post-BART maps on the following pages.

The City expanded the redevelopment boundaries of its two downtown projects, Yerba Buena Center and the Golden Gateway, to take advantage of non-cash credits to obtain additional federal matching funds.

Impacts on Local Government Expenditures: Three public improvement projects were initiated in response to BART at a total cost of $50 million, partially offset by $20 million in outside funding. They include the Embarcadero/Muni station, the Market Street Beautification Project, and the extensions of transit station mezzanines and of streets in the station areas.

BART's Construction Impacts: Because BART operates in a subway through downtown San Francisco, very little land was acquired for the system and no households were displaced. In total 2.1 acres were purchased.

The long period of cut-and-cover construction of the downtown BART stations (1967-1973) had substantial effects in the area. Streetcars, busses, and autos were rerouted from one side of the street to the other from time to time; sidewalks were narrowed, and retaining walls were placed against buildings. Access to stores was impaired, and some retailers reported declines in sales which they attributed, at least in part, to BART construction; however, other businesses in the same area reported no effects on their sales. The construction may have had more adverse effects on smaller stores that could not withstand adverse effects on their sales over a long period of time. However, the construction of BART signified a commitment to a transit corridor along Market Street and was one of several important factors encouraging new office development.

Impacts of BART's Transportation Service: In March 1978, about 49,100 daily BART trips started or ended at the four stations serving downtown San Francisco. This is about 34 percent of the 144,000 daily trips on BART. BART patronage at the downtown San Francisco stations has increased steadily at an average rate of 9 percent per year.

TABLE 9-2. ORIGINS OF TRIPS TO DOWNTOWN SAN FRANCISCO (MAY 1978)

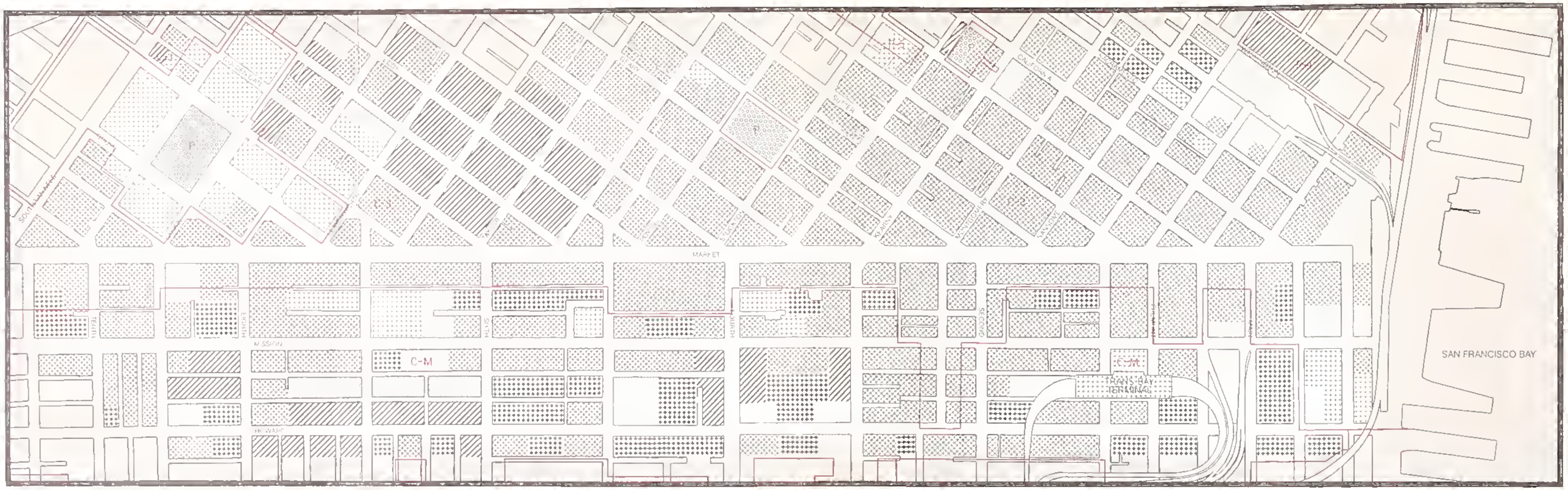
Origin Stations	Percent of Total BART Trips to Downtown San Francisco
West Bay Stations (San Francisco and Daly City)	44
East Bay Stations	
Concord Line	24
Richmond Line	5
Fremont Line	15
Oakland CBD	12
Total	100

Source: BART

Compared to other BART stations, the San Francisco urban core stations have the largest number of connecting bus lines. They have no parking lots. About 95 percent of the commuters to downtown San Francisco walk to and from the downtown stations; about 80 percent of them spend no more than eight minutes walking to their destinations from BART.

The predominant purpose of trips to the San Francisco urban core is work, as might be expected. About half of the San Francisco workers surveyed in 1977 who had recently changed jobs had considered proximity to BART in their job location decision. Among transbay commuters working in San Francisco, 57 percent said that they had looked for work with the idea of commuting on BART, and the same proportion stated that the proximity of the job to a BART station was a definite consideration in their decision to take their jobs.

According to key informants, BART service has had only a minimal impact on employers' location decisions. Firms locating in San Francisco do not rank access to the labor force very highly among their location decision criteria; considerations such as the prestige of a San Francisco location, the shops and restaurants, and good transportation access by a variety of modes are more frequently given as reasons. However, several employers, particularly government agencies, felt BART was an important determinant in location decisions.

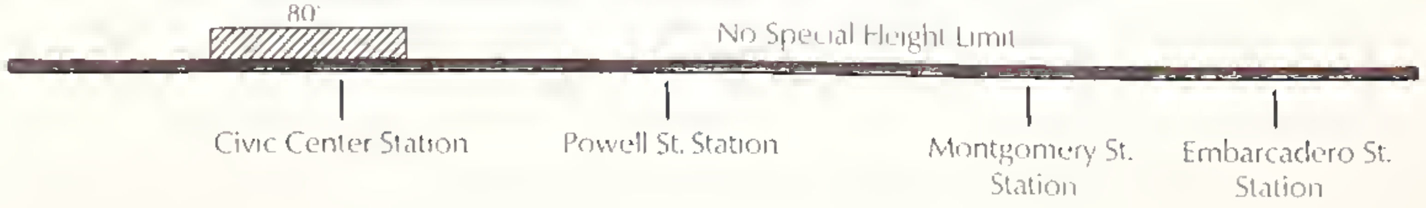


DOWNTOWN SAN FRANCISCO
1965 PRE-BART LAND USE AND ZONING

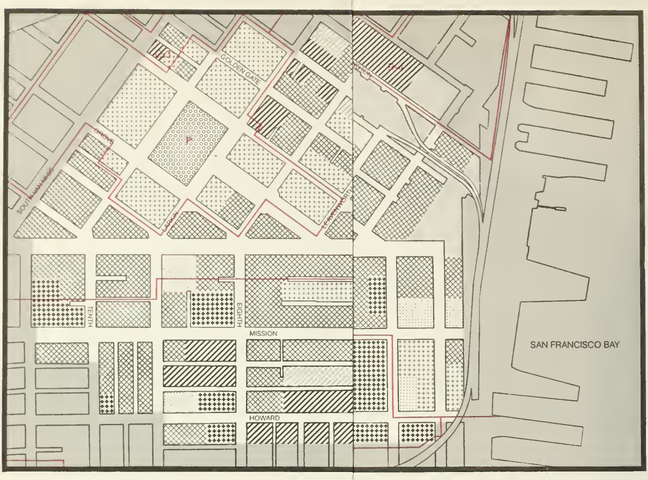
CIVIC CENTER • POWELL • MONTGOMERY • EMBARCADERO
STATION AREAS

LAND USE	
☐	Residential
▨	Residential over Commercial
░	Commercial and Office
▓	Industrial
░	Public and Institutional
▒	Park Open Space
☐	Vacant
☐	Parking

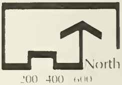
1965 ZONING	
R-4	High Density Residential
R-5	Highest Density Residential
C-3	Central Business
C-M	General Commercial
P	Public Use



1965 DOWNTOWN SAN FRANCISCO HEIGHT LIMITS
Market Street Section Vertical Scale 1" = 600'



DOWNTOWN SAN FRANCISCORO
1965 PRE-BART LAND USE AND Z



LAND USE

- ▨ Residential
- ▨ Residential over Commercial
- ▨ Commercial and Office
- ● Industrial
- ▨ Public and Institutional
- ▨ Park/Open Space
- ☐ Vacant
- ☐ Parking

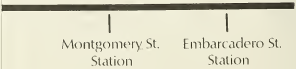
R-4

R-5

C-3

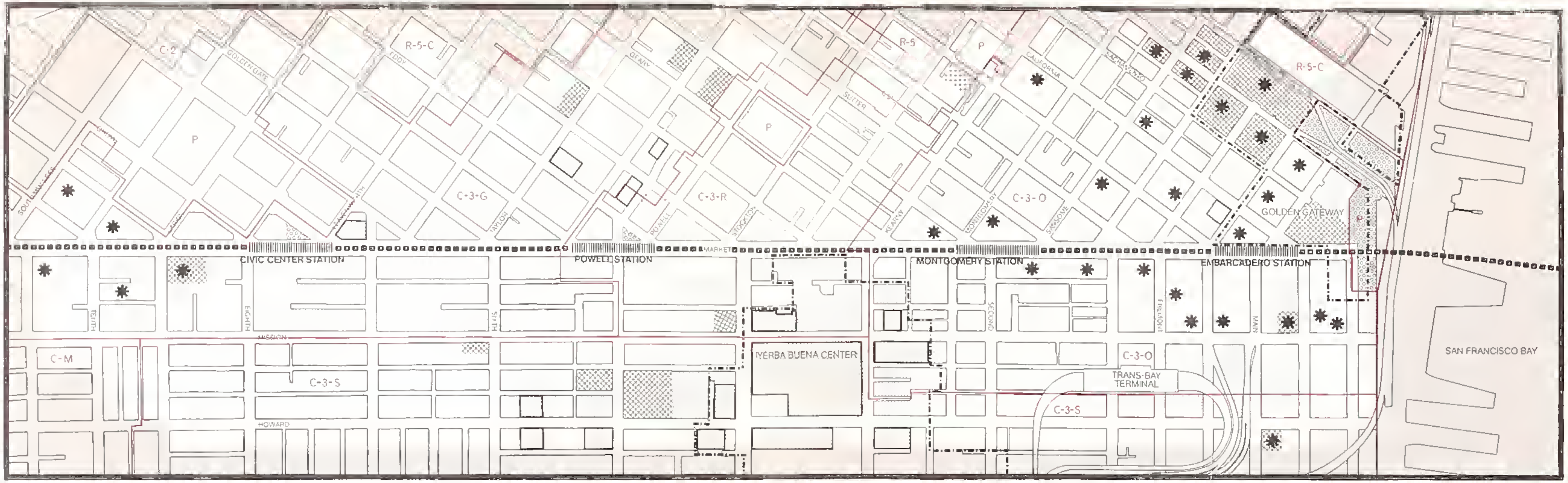
C-M

P ecial Height Limit



CO HEIGHT LIMITS

l Scale 1" = 600'



DOWNTOWN SAN FRANCISCO
1965-77 LAND USE CHANGES AND ZONING

CIVIC CENTER • POWELL • MONTGOMERY • EMBARCADERO STATION AREAS

LEGEND

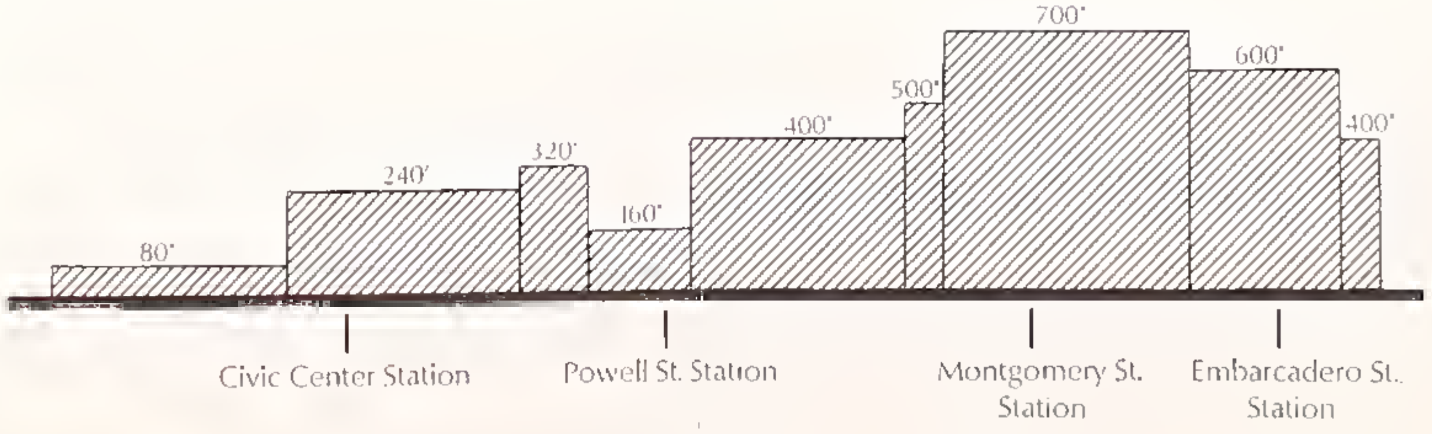
-·-·- Redevelopment Project
✱ Major New Building (over 100,000 sq. ft.)
☐ Demolition (no new use)

BART

||||||| Station Platform
------- Parking
■■■■ Subway Line
■□■ Surface Line
■▫■ Aerial Line

LAND USE	
☐	Residential
▩	Commercial and Office
▦	Public and Institutional
▩	Park Open Space
☐	Vacant
☐	Parking

1977 ZONING	
R-5	Highest Density Residential
R-5-C	Highest Density Residential/Community Business
C-2	Community Business
C-3-O	Downtown Office
C-3-R	Downtown Retail
C-3-G	Downtown General Commercial
C-3-S	Downtown Support
C-M	Heavy Commercial
P	Public Use



1977 DOWNTOWN SAN FRANCISCO HEIGHT LIMITS

Among shoppers surveyed in downtown San Francisco, 5 percent had begun shopping in the area since BART service began. More than 40 percent of these new shoppers said that BART service had induced them to shop in downtown San Francisco.

Impacts on Office Construction: Since 1960 office construction has flourished in San Francisco, averaging 1.2 million square feet per year. Most new office buildings have been constructed within five blocks of the four downtown BART stations (see map of 1965-77 land use changes). BART's most significant contribution was its influence on local land use policies and public projects, which made Market Street more attractive. When asked about specific BART impacts, key informants identified seven buildings attributable in some degree to BART, representing about 10 percent of the total office space built or under construction in San Francisco since 1965.

Impacts on Office Rents: Statistical studies indicate that BART may have had a slight positive impact on rents in buildings near the station. Between 1972 and 1978 a small proportion of dollar amount increase in rents, about 2 percent for offices within 100 feet of a station, could be attributed to the location near BART. However, the BART effect occurred in combination with several other interrelated variables, such as a location on Market Street.

Impacts on Retail Sales: Retail sales declined 11 percent in downtown San Francisco in terms of real dollars between 1958 and 1972, as increasing numbers of shoppers patronized suburban shopping centers. One-third of the merchants interviewed who stated that their sales had increased recently attributed this, in part, to BART.

Environmental Impacts: Because the BART system is underground in downtown San Francisco, it has caused few, if any, environmental impacts since the construction process ended.

Downtown Oakland

Oakland, 7.5 miles to the east of San Francisco and across the Bay, is considerably less transit-oriented than San Francisco. For instance, 49 percent of the work trips to downtown Oakland are by automobile, while only 25 percent are by automobile to downtown San Francisco.

The downtown Oakland area has three BART stations: the 19th and 12th Street stations which serve the downtown office and retail core, and the Lake Merritt station which serves the governmental, educational, and Chinatown areas, as well as a community college and the Oakland museum.

Impacts on Planning and Zoning: Downtown Oakland was declining in population and employment in the 1950s and early 1960s when BART was planned.

BART and several redevelopment projects were viewed by Oakland officials as key factors in revitalizing the area. One such project was the City Center Project adjacent to the 12th Street station, which was approved by the U.S. Department of Housing and Urban Development in 1965 as a $4 million six-block project. Using $2 million in BART construction costs as partial additional local credits, Oakland was able to increase the size of the Project to a $24.5 million, 15-block plan by 1972. The additional 12 blocks include a proposed regional shopping center and a park. However, delays in the completion of a segment of the Grove-Shafter freeway have delayed the shopping center project, for which freeway access is considered essential.

Oakland successfully consolidated public building locations around the Lake Merritt BART station near existing County and State office buildings. BART was used for a substantial portion of local credits for a community college (Peralta College) redevelopment project, and thereby made possible the development of the downtown campus, Laney College, which is adjacent to the Lake Merritt station. In the absence of BART the new campus most likely would have been built in a more suburban, less transit-oriented location. Also, BART's headquarters building was constructed directly over the Lake Merritt station.

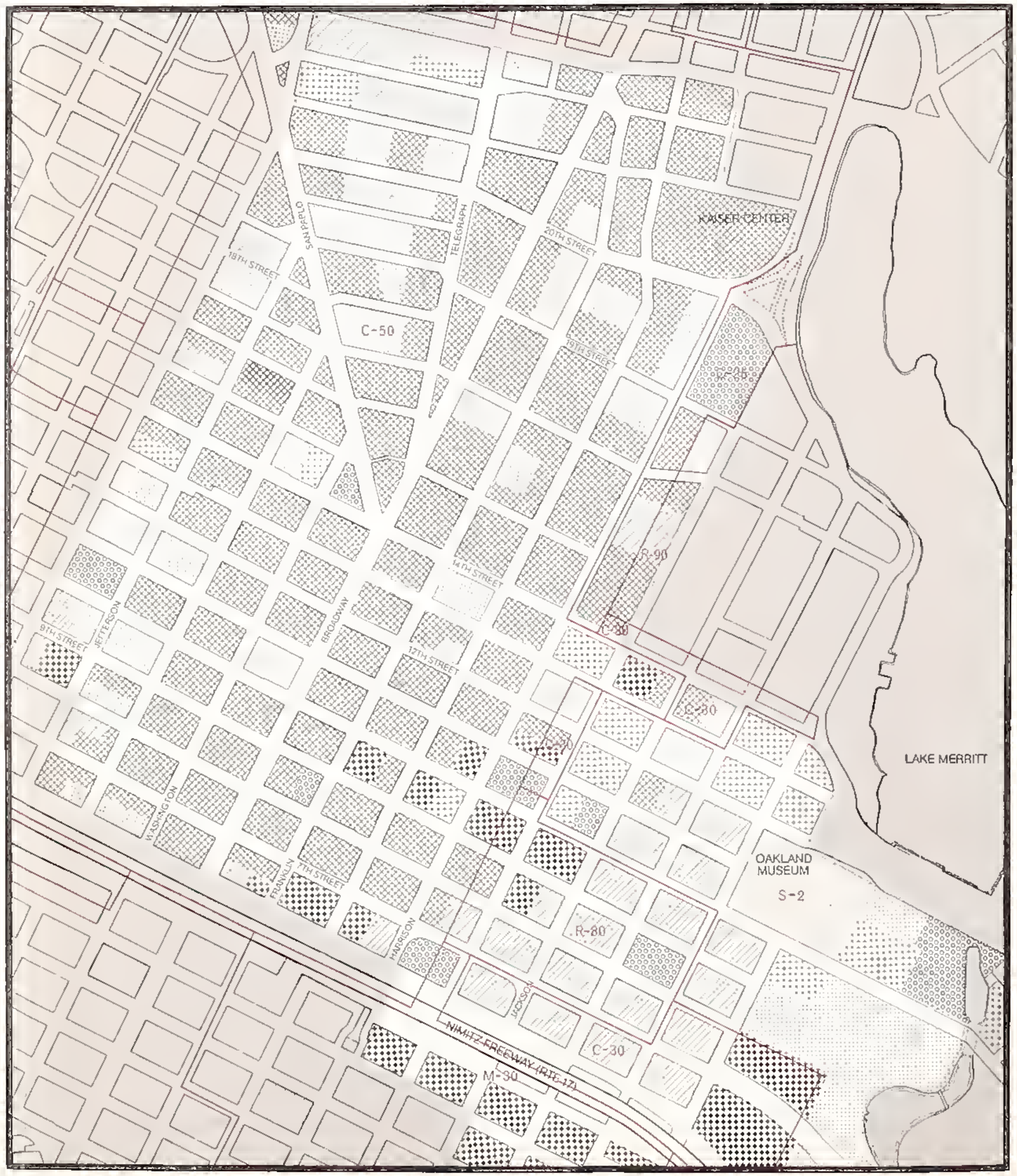
In addition to the redevelopment projects, the City initiated a $1 million street beautification project in the downtown area, and constructed a plaza at the City Center. BART provided a focus and partial funding for these projects.

Zoning for downtown Oakland exceeded the general level of development at the time BART was planned, and although some planning and zoning policies have changed in conjunction with BART, the changes provide fewer incentives for intensive development around BART than those in San Francisco. The rezonings, which were completed in 1970, establish a new zoning district around the 12th and 19th Street BART stations (see maps on following pages). More retail activities are allowed in the new district than in other districts, and no provisions for off-street parking are required. In 1976 a special exception to off-street parking requirements was provided for buildings within 600 to 1,500 feet of a BART station in two other zoning districts in the downtown Oakland area. Parking requirements were reduced from 25 percent for residential uses to 50 percent for commercial and office uses.

Impacts on Local Government Expenditures: BART's major impact was to provide a convenient vehicle for financing projects such as street widenings and the provision of access to BART stations from the Ctiy Center Plaza and the Oakland Coliseum. The result is a net gain to the City of $1.5-2.5 million, if noncash contributions are viewed as an indirect impact.

BART's Construction Impacts: Although BART lines and stations are in subway in downtown Oakland as they are in San Francisco, the amount of land acquired was greater in Oakland, partially because the Lake Merritt station includes

DOWNTOWN OAKLAND
12TH ST. • 19TH ST. • LAKE MERRITT STATION AREAS
1965 PRE-BART LAND USE AND ZONING



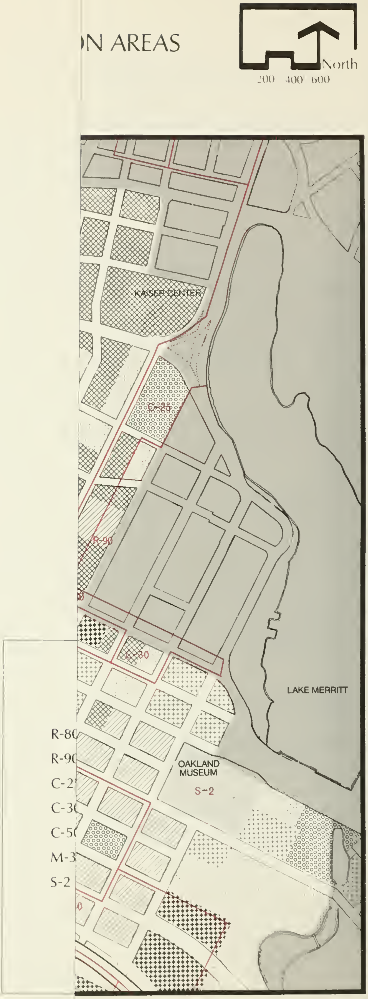
LAND USE

- ░ Residential
- ▒ Commercial and Office
- ▓ Industrial
- ░ Public and Institutional
- ▒ Park Open Space
- ☐ Vacant
- ☐ Parking

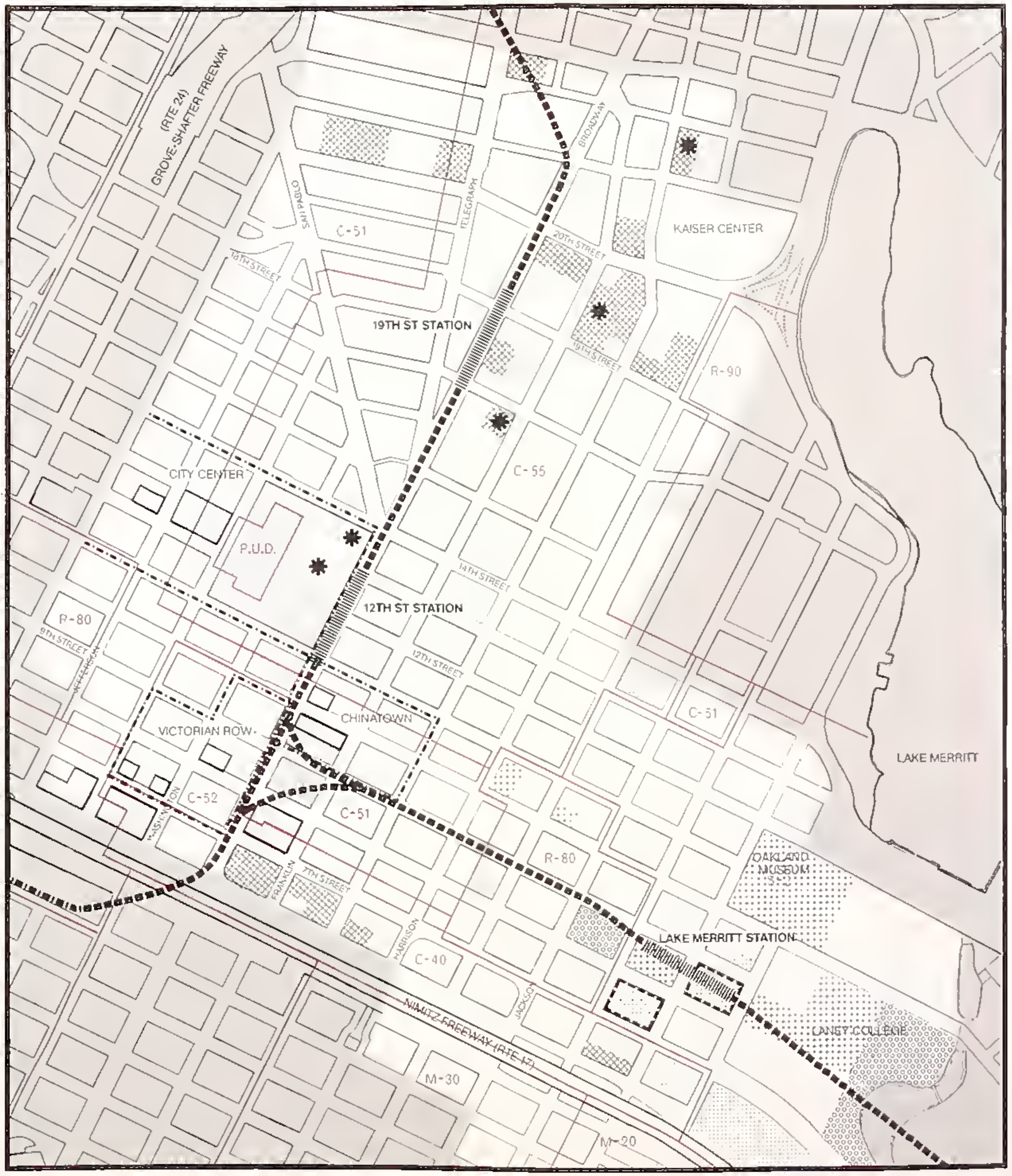
1965 ZONING

R-80	High Rise Apartment Residential
R-90	Downtown Apartment Residential
C-25	Office Commercial
C-30	District Thoroughfare Commercial
C-50	Central Business Commercial
M-30	General Industrial
S-2	Civic Center

N AREAS


North
200
400
600
KAISER CENTER
C-25
R-90
C-30
LAKE MERRITT
OAKLAND
MUSEUM
S-2
R-8
R-9
C-2
C-3
C-5
M-3
S-2

DOWNTOWN OAKLAND
12TH ST. • 19TH ST. • LAKE MERRITT STATION AREAS
1965-77 LAND USE CHANGES AND ZONING



LEGEND

-·-·- Redevelopment Project
✱ Major New Building (over 100,000 sq ft)
☐ Demolition

BART

▥ Station Platform
---- Parking
▪▪▪▪ Subway Line
▬▬▬ Surface Line
▪▬▪ Aerial Line

LAND USE

☐ Residential
▨ Commercial and Office
▨ Public and Institutional
▨ Park Open Space
☐ Vacant
☐ Parking

1977 ZONING

R-80	High-Rise Apartment Residential
R-90	Downtown Apartment Residential
C-40	Community Thoroughfare Commercial
C-51	Central Business Service Commercial
C-55	Central Core Commercial
C-52	Old Oakland Commercial
M-20	Light Industrial
M-30	General Industrial
S-2	Civic Center
P.U.D.	Redevelopment Area

a parking lot. BART purchased a total of 37.5 acres in downtown Oakland, displacing about 400 households. About 12.3 acres were in commercial or industrial use, and 11.2 in residential use.

Cut-and-cover construction was used for both lines and stations in downtown Oakland. This had disruptive effects on pedestrian and vehicular traffic, and retail business activity declined markedly during the construction period. Nor were building permits for new office construction near the BART construction sites issued as frequently during the construction period as during other times. However, key informants attribute at least some of the decline in business activities to the demolition and construction activities for redevelopment projects, which were occurring at the same time. (Since BART allowed an expansion of the City Center Redevelopment Project, the system could be considered the "cause" of business declines attributed to the project.)

Impacts of BART's Transportation Service: Daily patronage at the three Oakland downtown stations averaged 13,800 in March 1978; this is about 9.5 percent of the total daily BART patronage. Patronage in downtown Oakland has been relatively static since transbay service began. The 12th and 19th Street stations accounted for 80 percent of the trips at the three stations. Oakland CBD stations are primarily destination stations, as are those in San Francisco, but they also serve as origin stations for some San Francisco-bound commuters. About 29 percent of the trips to downtown Oakland originate in the West Bay, primarily in downtown San Francisco.

TABLE 9-3. ORIGINS OF TRIPS TO DOWNTOWN OAKLAND (MAY 1978)

Origin Stations	Percent of Total Trips to Downtown San Francisco
West Bay Stations (San Francisco and Daly City)	29
East Bay Stations:	
Concord Line	17
Richmond Line	18
Fremont Line	30
Oakland CBD	6
Total	100

Source: BART

The Oakland urban core stations are well served by connecting bus lines. No parking is provided at the 12th and 19th Street stations, the Lake Merritt station provides parking for 225 vehicles. Walking and busses are the predominant means of access to and from the BART stations; 40 percent of BART travellers use busses and another 40 percent walk. About 86 percent of commuters to downtown Oakland work within a eight-minute walk of the station.

BART is not used by many of the elderly residents in downtown Oakland who comprise 30 percent of the resident population within a half-mile of the BART station. Although the two downtown Oakland stations have the largest percentages of elderly persons entering the BART system among the 34 stations, interviews suggest that many elderly persons do not use the system because they are not familiar with it, and because it does not serve their destinations. Some stated that walking to the BART station is a problem for them.

BART attracts a significant share of work trips to the City Center; about half of the employees in the Clorox and Wells Fargo office buildings in the Center use BART to commute to work.

Over half of the workers surveyed in downtown Oakland who recently have changed jobs viewed BART as an important factor in their job location decisions.

BART has had an impact on the location decisions of several employers in downtown Oakland. The Clorox Company decided to remain in Oakland because of the City Center Project and BART; the federal Department of Energy, another City Center tenant, chose that location on the basis of BART's service; and Blue Cross might have located elsewhere except for the service provided by BART to downtown Oakland.

New shoppers in downtown Oakland tend to be BART riders, and about 27 percent of the new shoppers surveyed said that BART was the reason they had begun to patronize downtown Oakland.

Impacts on Office Construction: About two million square feet of major new office space has been built in downtown Oakland since 1965. While this amount is not large in comparison to the new office space in San Francisco, it is substantially more than elsewhere within the BART service area. Total office space in downtown Oakland is five million square feet, compared to 40 million in San Francisco. About 1.5 million of the two million square feet of new office space was built within 1,500 feet of the 12th or 19th Street stations. BART was considered a factor contributing to the location of 80 percent or 1.2 million square feet of the new space in the vicinity of the stations. Both BART and the City Center Project were factors in the location of two of the major buildings, Clorox and Wells Fargo. The buildings in the Center have not rented as quickly as new office space in San Francisco, although their rents are lower. Rents for desirable space in new Oakland buildings range from $.75 to $1.00 per square foot per month; in San Francisco comparable space rents for $1.00 to $1.25. About 10 percent of the occupancy in the new buildings represents shifts from the older buildings.

Impacts on Retail Sales: Retail sales in downtown Oakland were declining prior to BART's construction, and they have continued to decline since BART service began at about the same rate. One-fifth of the merchants in downtown Oakland who were interviewed perceived some increase in their sales which they attributed to BART. BART was frequently cited as a benefit to the downtown by merchants near the stations. However, most of them agree that significant changes in downtown Oakland will not occur until the City Center project is complete and the Grove-Shafter freeway segment to downtown Oakland is opened. Some merchants reported a shift in trade toward San Francisco since BART service began, but others disagreed, stating that increasing numbers of suburban shoppers had been coming to downtown Oakland.

Environmental Impacts: In downtown Oakland, as in San Francisco, stations and lines are underground. Therefore, there is little or no environmental impact at the 12th and 19th Street stations. At the Lake Merritt station, an estimated 100 to 150 autos park on the streets around the station because the parking lot is fully utilized. The most probable future environmental impact is likely to be continued and increasing problems related to parking and traffic flow around the Lake Merritt station.

EFFECTS IN URBAN RESIDENTIAL AREAS

The Mission District of San Francisco, the City of Richmond, and the Rockridge District of Oakland present contrasting pictures of the types of urban areas served by BART. San Francisco's Mission District is a densely populated, mixed commercial and residential area containing a high proportion of pre-1940 housing. Much of the housing is medium to high density rental housing interspersed with attractive nineteenth century Victorian homes. More than half of the 107,000 residents living within a mile of the 16th or 24th Street subway stations are minorities -- largely Latinos, but also Asians and blacks. The median family income (1969) of $7,200 was lower than that of the other urban residential case study areas.

The City of Richmond is an urban subcenter located approximately 15 miles north of Oakland. The City, with a large black population, has experienced a substantial decline in its population and economic base since the end of World War II when the Kaiser Shipyards were closed. A redevelopment agency organized in the 1950s has keyed many of its planning efforts to BART. The station is located at grade on the edge of the downtown area, and single family homes and small apartments dating from the 1940s and 1950s also adjoin the station. The downtown commercial district remains quite depressed and there are many sites cleared by renewal that are still vacant.

The Rockridge District is typical of a middle income, white neighborhood with older single family and duplex housing and with strip retail and commercial development along College Avenue. Most of the housing was built between 1910 and 1930. Although the proportion of blacks has been increasing since 1970, Rockridge has not undergone the white exodus that occurred in some other Oakland neighborhoods. Many Rockridge households have lived there for 30 years, but recently young couples and singles have been moving in as older residents have left.

Characteristics of these areas are summarized in Table 9-4.

The Mission District

The Mission District is located in southeast San Francisco, and is one of San Francisco's oldest neighborhoods; an early California mission founded there in 1776 is still standing. BART station construction began in the District in 1967 and was completed in 1972. Two BART stations were built in the District, the 16th Street station and the 24th Street station.

Impacts on Planning and Zoning: Community groups were not involved in the early planning stages for BART. However, expectations and apprehensions about BART's impacts developed as a result of projections of major changes in development patterns. Community residents organized around issues related to BART during the construction period. The participants were primarily Latinos and Chicanos, who organized a Jobs on BART (JOBART) program to seek a proportion of the employment opportunities on the BART project for Mission District residents. Later the focus switched to one of protecting the character of the District, and participants sought downzoning around the stations. In 1972, in response to these pressures, the City of San Francisco reduced height limits around the two BART stations. New zoning measures went into effect in 1975 which restricted a number of streets around the station to residential development (see maps on following pages). Further recommendations for rezoning around the stations have been made; they call for changing areas designated for high density residential development to medium density, with the exception of a few blocks around the 16th Street station. It appears likely that continuing restrictions on development around the stations can be expected. As a consequence, opportunities for high density, transit-oriented developments will be minimal.

A $90 million redevelopment project proposed in 1966 was strongly opposed by Mission District residents and subsequently abandoned. A $2.5 million Mission Street Beautification Project was initiated in 1971 for improvements around the BART stations.

BART's Construction Impacts: The BART District acquired land only for station entrances in the Mission; a total of 0.8 acres, since the system is a subway there. Eight small businesses were affected. The cut-and-cover construction of the

TABLE 9-4. SUMMARY STATISTICS FOR URBAN RESIDENTIAL CASE STUDY AREAS*

Employment	Mission District	Richmond	Rockridge
1965	13,500	5,200	3,400
1970	12,000	5,400	2,900
1975	12,800	5,500	3,100
Average Annual Growth Rate (Percent)	0.53	0.56	0.90
Resident Population			
1965	29,700	18,800	19,600
1970	29,700	16,500	17,600
1975	26,000	13,600	16,400
Average Annual Growth Rate (Percent)	-1.3	-3.2	-1.8
1970 Residents' Demographics			
Black (Percent)	3.7	37.5	33.8
Spanish Heritage (Percent)	37.4	17.4	5.2
Median Income (1969 Dollars)**	$7,200	$8,400	$11,900
Average Daily BART Patronage (1978)	5,700	1,600	2,200
16th St. Station	2,300		
24th St. Station	3,400		

* Statistics are for census tracts contiguous to the BART stations. In the Mission District this area is approximately 2 mi. x 1/2 mi.; in Richmond, 1 mi. x 1 mi.; in Rockridge, 1 mi. x 1/2 mi.

** Median income of families and unrelated individuals.

Source: U.S. Census, Association of Bay Area Governments, BART

BART facilities disrupted movement in the area. Residents reported that parking, getting to and from work, schools and stores, and going places on foot were made more difficult by the construction activities. Most merchants interviewed agreed that building BART adversely affected retail sales activity. However, retail sales in the Mission were declining before the period of BART's construction; the BART effect may have intensified the decline.

Impacts of BART's Transportation Service: In March 1978, average daily BART patronage at the two Mission stations was 5,700. The destination of 60 percent of the patrons entering the stations is downtown San Francisco; 23 percent are going to the East Bay, and the others to other West Bay stations. There are no BART parking lots in the Mission District, but each station is served by nine connecting bus lines. About two-thirds of all riders walk to and from the Mission stations; the others ride busses or are dropped off by automobile. Most persons use BART from the Mission District to go to work (60 percent); 14 percent of the trips are for personal business, and 10 percent are trips to school.

None of the major employers moving into the Mission report that BART service was a factor in their location decisions. No major retailers have moved into the area; in fact, Mission District residents are concerned because several large retailers have left. Mission District merchants who have remained in the area generally view BART as a stabilizing influence with the potential for extending their markets to new customers. However, among several merchants interviewed, only one thought that BART had increased retail sales.

The Household Survey of persons moving into the Mission District indicated that their location decisions did not involve BART, but rather the lower housing prices and the Victorian homes available in the area. However, BART was a major consideration in the decisions of a few: 14 percent of those who moved within a 10-minute walking distance of the stations, and 5 percent of those who moved to locations further from the stations.

Impacts on New Construction and Rehabilitation: BART's impact on housing and commercial development in the Mission District has been minimal, as might be expected in view of the downzoning. Since the 1960s only one major office building has been built near a BART station. Few buildings have been renovated. Nor has any significant residential development occurred within 1,500 feet of a BART station in the Mission District. Rehabilitation of homes around the stations occurred less frequently than in neighborhoods at some distance, but this was not related to BART. Fewer of the buildings near the stations were occupied by their owners, and the streets adjacent to the stations are more predominantly mixed commercial-residential uses. Neither of these circumstances is conducive to rehabilitation activities.

Impacts on Property Prices and Rents: BART has had an effect only in the vicinity of the 24th Street station, and there the impacts has been on commercial and residential prices, but not on rents. There was a significant increase

MISSION DISTRICT STUDY AREA MAPS

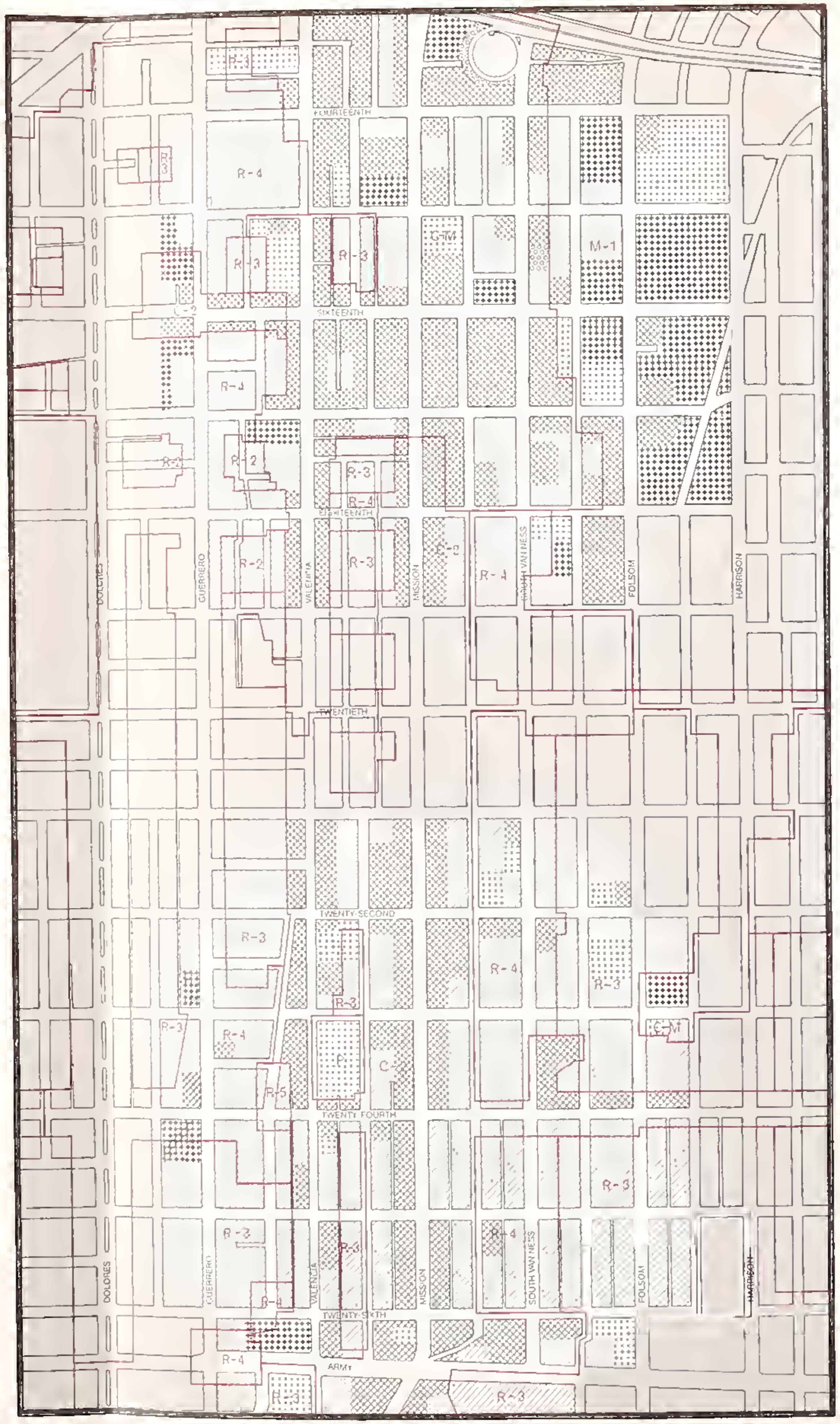
MISSION DISTRICT
16TH ST. • 24TH ST. STATION AREAS
1965 PRE-BART LAND USE AND ZONING

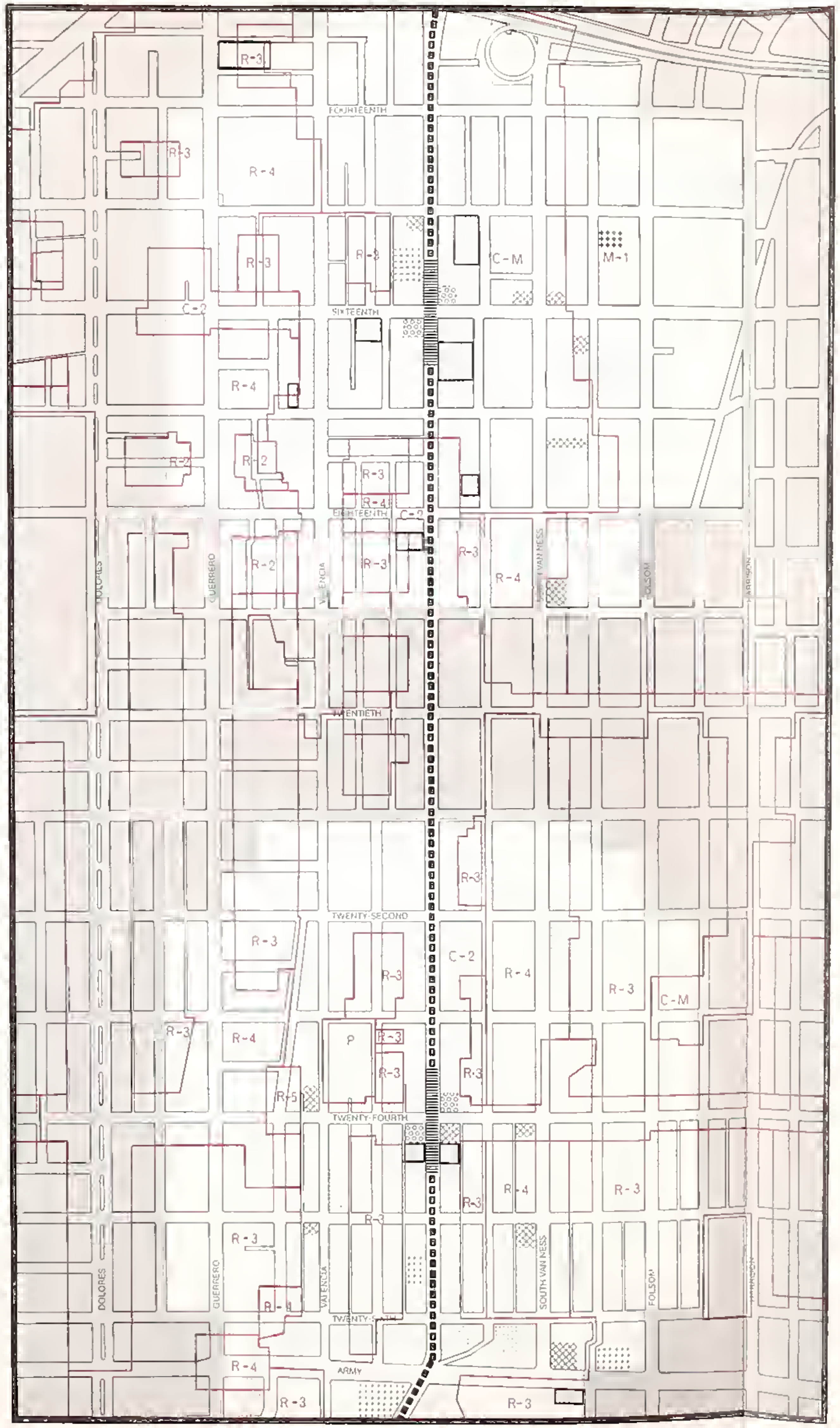
LAND USE

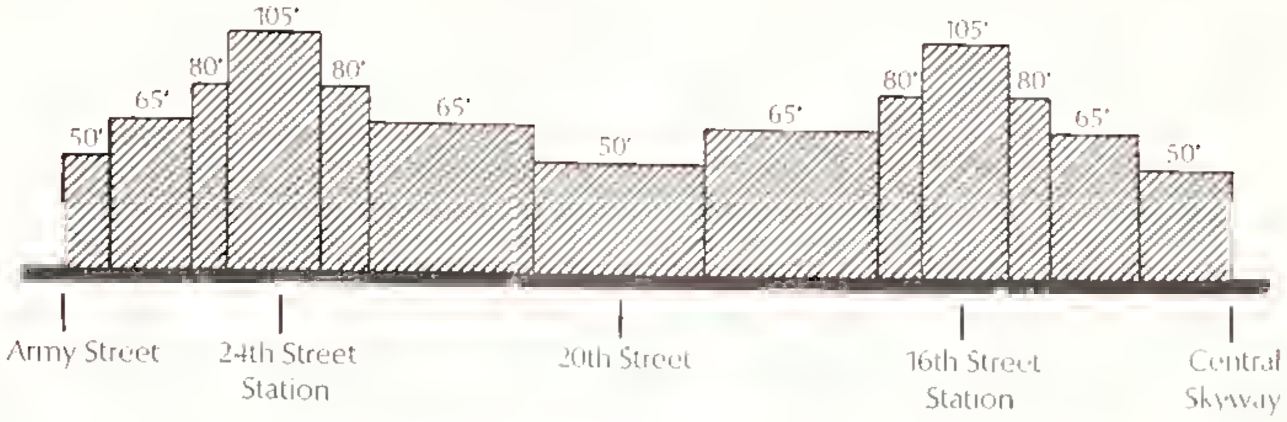
□	Residential
▒	Commercial and Office
▓	Industrial
░	Public and Institutional
▨	Park Open Space
□	Vacant
□	Parking

1965 ZONING

R-1	Single Family Residential
R-2	Two Family Residential
R-3	Low-Medium Density Residential
R-4	High Density Residential
R-5	Highest Density Residential
C-2	Community Business
C-M	Heavy Commercial
P	Public Use
M-1	Light Industrial







1977 MISSION DISTRICT HEIGHT LIMITS
Mission Street Section Vertical Scale 1" = 100'

MISSION DISTRICT
16TH ST. • 24TH ST. STATION AREAS
1965-77 LAND USE CHANGES AND ZONING

North
200' 400' 600'

BART

▮▮▮▮	Station Platform
-----	Parking
■■■■	Subway Line
▬■▬	Surface Line
●▮●▮	Aerial Line

LAND USE

▨	Residential
▩	Commercial and Office
▦	Industrial
⁘	Public and Institutional
▤	Park/Open Space
☐	Parking
☐	Demolition (no new use)

1977 ZONING

R-1	Single Family Residential
R-2	Two Family Residential
R-3	Low-Medium Density Residential
R-4	High Density Residential
R-5	Highest Density Residential
C-2	Community Business
C-M	Heavy Commercial
P	Public Use
M-1	Light Industrial

in prices of commercial properties near the station during the construction period, as a result of anticipations of BART's effects. However, the impact has disappeared since BART service began, and since the area was downzoned. The sales prices of homes were similarly affected; during the construction period prices increased, but since service began there have been no increases attributable to BART.

Environmental Impacts: As in areas near other subway portions of the BART system, the impacts of operations along Mission Street are minimal.

Richmond

Richmond is a medium-size city 15 miles north of Oakland. Richmond's population grew rapidly during World War II, from 23,000 in 1940 to 120,000 in 1945. After the War, the shipyards and auto assembly plants closed, and the population fell to 100,000 in 1950, and to 72,000 in 1960. Annexations during the 1960s caused a population increase, but it has been declining in recent years. The downtown core of Richmond, which is four to five blocks from the BART station, has been declining for some time. The Redevelopment Agency has been active in the area around the BART station, but success in attracting new developments has been limited to date.

Early BART plans called for the Richmond station, the terminal station on the line, to be located to the west of the downtown area. In 1965 BART and the City agreed to a new location several blocks to the east of the downtown, between two possible redevelopment areas. The Richmond station is within the Southern Pacific Railroad's right of way; it was built in the period of 1970-1972.

Impacts on Planning and Zoning: The BART station was part of the planning for the redevelopment area in which it was built. The area was called the "Iron Triangle" because it was surrounded by railroad tracks and at-grade crossings. A 1967 plan called for intensive mixed land uses in the station area. The plan continues to guide Richmond's capital improvement programming.

BART enabled the City to finance an expanded $21 million redevelopment project adjacent to the station which was intended for commercial developments. However, plans for a competing shopping center with freeway access at some distance from BART were approved in 1970; with the opening of this new center in 1976, the Redevelopment Agency abandoned its earlier efforts to create a regional shopping center adjacent to BART. The area is now promoted as a service center.

A six-block pedestrian mall and beautification project, Nevin Mall, was constructed to link the BART station with downtown Richmond. BART provided grade separations for the railroad tracks in the Iron Triangle area.

The maps on the following pages show pre-BART and post-BART land use and zoning, Nevin Mall, and the redevelopment project area.

Impacts on Local Government Expenditures: Richmond realized $3-4 million in noncash savings as a result of BART's location there. This includes $2 million in credits toward obtaining federal redevelopment funds and $1.6 million in grade separation costs paid by BART. Capital improvements related to BART include the grade separation projects, the construction of Nevin Mall, a pedestrian overcrossing, a street widening, and the redevelopment project.

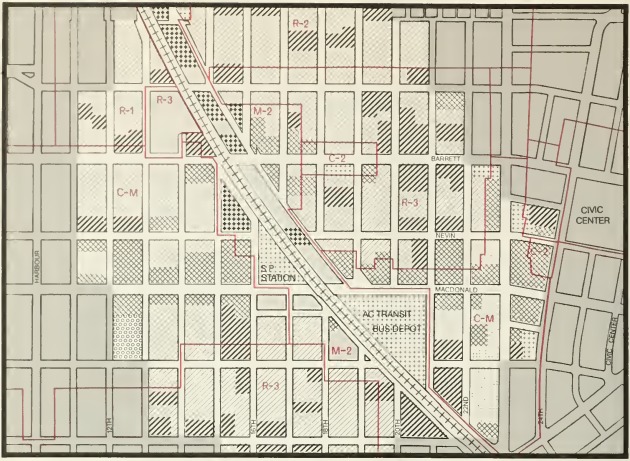
BART's Construction Impacts: In Richmond, where the BART station is on the site of a former railroad station, the BART District acquired a total of 68.3 acres of land. One hundred and seventy residential units were displaced; some commercial, industrial, and railroad properties were also acquired. The impacts of building the facilities were minimal because of their location near a railroad and near land cleared for redevelopment.

Impacts of the Transportation Service: BART does not provide direct transbay service from Richmond; patrons must transfer in downtown Oakland for trips to San Francisco. AC busses provide frequent local and express bus service in Richmond, and several bus lines parallel the BART routes. For these reasons, patronage has been low at the Richmond station, particularly in comparison, Richmond attracts few trips from areas beyond the BART lines because it does not have a direct connection with the freeway from the north. Most travellers from areas to the north use BART from the El Cerrito Del Norte station, where there is a direct connection. The Richmond station serves an equal number of travellers arriving for destinations in Richmond as those departing. Those arriving at the station in the morning peak travel period are generally bound for one of the dispersed employment centers in the vicinity. BART does not attract large numbers of commuters to work in Richmond because adequate parking is provided at the various employment centers, and because of the BART service limitations.

BART has not greatly improved transportation to employment centers for the large proportion of Richmond residents who are blue-collar workers, because it does not provide direct service to industrial areas, oil refineries, and ports in the Bay Area. According to some persons interviewed, the system would be used more frequently for those destinations if adequate feeder service between BART and the employment centers existed. However, BART has expanded transit service for those Richmond residents who are clerical and professional white-collar workers in downtown Oakland and San Francisco, in the opinions of a number of persons interviewed.

Most of the major employers in the Richmond area had located there prior to the coming of BART; their location decisions cannot be attributed to the system. However, one large employer, the Social Security Administration, moved its offices to Richmond from San Francisco both because a large building site was available and because of BART's service.

RICHMOND STUDY AREA MAPS



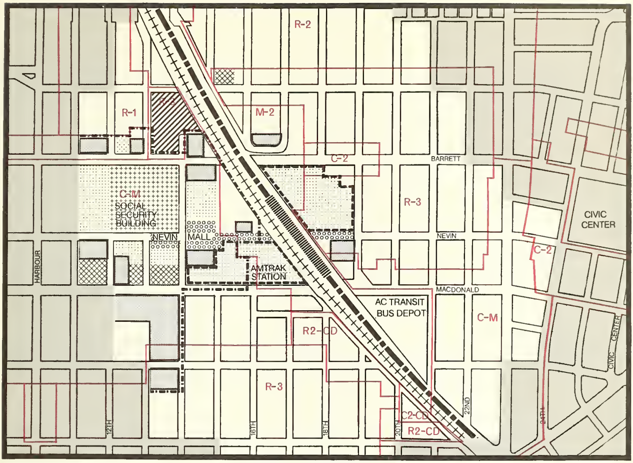
RICHMOND STATION AREA
1965 PRE-BART LAND USE AND ZONING

LAND USE

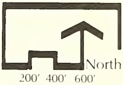
░	Single Family Residential
▨	Multi-Family Residential
▩	Commercial and Office
⁙	Industrial
⋯	Public and Institutional
▦	Park/Open Space
▭	Vacant
□	Parking

1965 ZONING

R-1	Single Family Residential
R-2	Multi-Family Residential
R-3	High Density Residential
C-2	General Commercial
C-M	Central Business
M-2	Light Industry



RICHMOND STATION AREA
1965-77 LAND USE CHANGES AND ZONING



BART

- |||||||||| Station Platform
- ----- Parking
- ■■■■ Subway Line
- ■■■ Surface Line
- ■·■·■ Aerial Line

LAND USE

▨	Multi-Family Residential
▩	Commercial and Office
⊞	Public and Institutional
▦	Park/Open Space
░	Parking
☐	Demolition (no new use)
—·—·—	Redevelopment Project
++++	Southern Pacific RR

1977 ZONING

R-1	Single Family Residential
R-2	Multi-Family Residential
R-3	High Density Residential
C-2	General Commercial
C-M	Central Business
M-2	Light Industry
R2-CD	Multi-Family Controlled Development
C2-CD	General Commercial Controlled Development

Impacts on New Construction: A new Social Security Administration building where 2,000 persons are employed, and a new Kaiser Medical complex are the major new buildings in the redevelopment project adjoining the BART stations. Neither of these buildings would have been located in Richmond in the absence of BART; they are the most important land use impacts of the system in Richmond to date. A large portion of the redevelopment project remains vacant, however, and there has been little new construction in the City as a whole since 1960.

BART has had little impact on housing construction in Richmond. Little new housing has been built in the redevelopment area, and only three rehabilitation loans were issued in the period of 1975-77. As long as population continues to decline in Richmond, there is little likelihood of an expansion in the housing market.

Environmental Impacts: There have been no major impacts on the environment in Richmond as a result of BART's operations. The station is lightly used, parking is adequate, and community noise levels mask the BART train sound.

Rockridge

Rockridge, a community in North Oakland about three miles from the downtown, is an area of approximately one square mile with a population of 9,000. There are 4,000 dwelling units in the area; about half are single family homes and half are small apartments or duplexes. Most of the housing was built before 1930, and many residents have lived in the area for two or three decades. Recently, however, young couples and single people have begun to move to Rockridge. A commercial street, College Avenue, divides the relatively large and expensive homes in eastern Rockridge from the smaller homes to the west.

In 1958 the State Division of Highways planned a freeway segment (the Grove-Shafter freeway) through Rockridge. The plan was bitterly but unsuccessfully opposed by the residents. Later it was decided to place BART in the freeway median. The freeway and BART were built simultaneously, between 1966 and 1972.

Impacts on Planning and Zoning: Residents of the Rockridge area have successfully opposed higher density developments. A 1968 Oakland Planning Department report identified the Rockridge area as a suitable location for high-rise apartment development around the BART station. In 1970 a developer planned a seven-story, 83-unit apartment building near the station. Strong community opposition developed, and led to the formation of the Rockridge Community Planning Council, a coalition of several neighborhood groups which worked for the preservation of the existing character of the neighborhood. As a result of community pressures, the City of Oakland downzoned the area in 1974 to prevent any substantial development beyond current uses (see maps of pre-BART and post-BART zoning on the following pages). A Citizens' Design Review Committee was established to review any future rezoning or development proposals.

BART's Construction Impacts: In the Rockridge area the Grove-Shafter freeway median was widened 80 feet to accommodate BART; therefore, the land acquired to build BART includes both direct acquisition by the BART District and the additional land required for the freeway to accommodate the system. One hundred and thirty residential units, in total, were displaced to build BART in the Rockridge area.

Impacts of BART's Transportation Service: In March 1978, about 2,200 daily BART trips began or ended at the Rockridge station; about 4 percent of the population living within three miles of the station used BART on any given day. Fifty percent of the trips from Rockridge were to downtown San Francisco, 6 percent to other stations in the West Bay, 7 percent to downtown Oakland, and 37 percent to other East Bay stations. The station has three connecting AC Transit bus lines, including one that connects the station to the University of California. About 42 percent of the patrons drove to the station and parked, 22 percent came by bus, 27 percent walked, and 8 percent were dropped off. The 766 parking spaces in the BART lot generally satisfy the demand for parking.

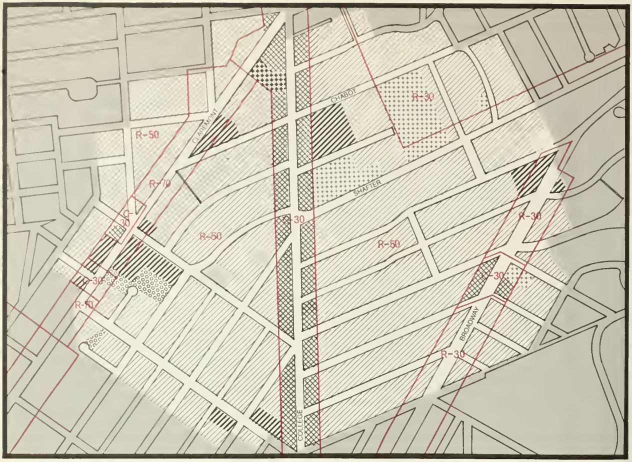
Since the Rockridge area was fully developed before the coming of BART, and zoning regulations have precluded any more intensive development of the area, BART has had no opportunity to influence office, housing, or retail developments.

Impacts on Property Prices and Rents: The price of houses in the Rockridge area fell during the period of freeway and BART construction because of apprehensions about the effects on the residential neighborhood. Since the adoption of restrictive zoning measures, prices have escalated and the rehabilitation of housing has increased.

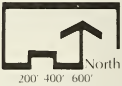
EFFECTS IN SUBURBAN AREAS

BART was intended to serve trips between the San Francisco-Oakland urban core and the distant suburbs that began their greatest growth in the 1950s and 1960s. The two areas studied have participated dramatically in that growth. Both the Fremont and Walnut Creek BART stations serve largely white resident populations of above-median income. Both adjoin major subregional shopping centers, and they have similar daily BART usage. Both function predominantly as park-and-ride facilities. A majority of Walnut Creek workers are employed in downtown Oakland or San Francisco. A smaller proportion of Fremont workers are employed in the central cities, but its share of commuters to Oakland and San Francisco is increasing. Table 9-5 summarizes population statistics and BART patronage for the two areas.

ROCKRIDGE STUDY AREA MAPS



ROCKRIDGE STATION AREA
1965 PRE-BART LAND USE AND ZONING

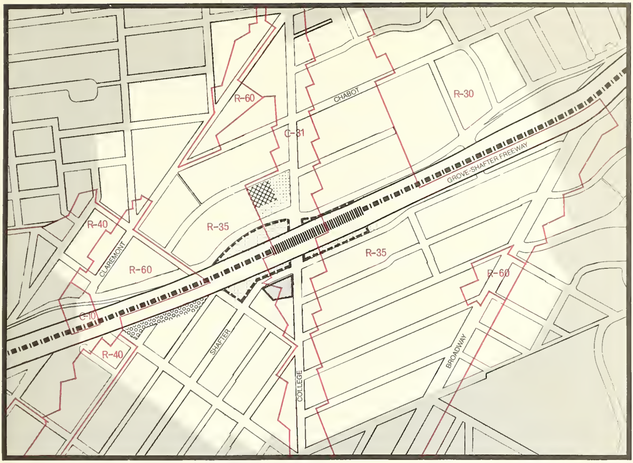


LAND USE

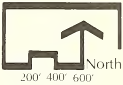
- ░ Single Family Residential
- ▨ Multi-Family Residential
- ▒ Commercial and Office
- ▦ Industrial
- ⠿ Public and Institutional
- ⁘ Park, Open Space
- □ Vacant

1965 ZONING

R-30	Single Family Residential
R-50	Medium Density Residential
R-70	High Density Residential
C-30	District Thoroughfare Commercial



ROCKRIDGE STATION AREA
1965-77 LAND USE CHANGES AND ZONING



BART

‖‖‖‖‖‖	Station Platform
- - - - -	Parking
■■■■	Subway Line
▬▬▬	Surface Line
■▮■▮■	Aerial Line

LAND USE

▩	Commercial and Office
▨	Park/Open Space
☐	Demolition (no new use)
⬚	Parking

1977 ZONING

R-30	Single Family Residential
R-35	Single and Two-Family Residential
R-40	Garden Apartment Residential
R-60	Medium-High Density Residential
C-10	Local Retail Commercial
C-31	Special Retail Commercial

TABLE 9-5. SUMMARY STATISTICS FOR SUBURBAN CASE STUDY AREAS*

Employment	Walnut Creek	Fremont
1965	21,000	13,600
1970	28,000	23,700
1975	32,700	26,800
Average Annual Growth Rate (Percent)	4.5	7.0
Resident Population		
1965	42,100	46,700
1970	64,800	104,900
1975	82,600	121,300
Average Annual Growth Rate (Percent)	7.0	10.0
1970 Residents' Demographics		
Black Population (Percent)	0.3	0.4
Spanish Heritage Population (Percent)	4.3	16.1
Median Income (1969 dollars)**	\$14,600	\$11,800
Average Daily BART Patronage (1978)	3,800	3,900

* Statistics are for those census tracts judged to comprise the catchment area for each station.

** Median income of families and unrelated individuals.

Source: U.S. Census, Association of Bay Area Governments, BART

The Walnut Creek station is on the fringe of an older shopping district that has undergone major retail and office expansion. By contrast, the Fremont station was located in a largely undeveloped portion of the city long-planned as a central business district.

Walnut Creek

Walnut Creek is in Contra Costa County, at the intersection of two main freeways (Interstate 680 and Route 24) about 15 miles east of Oakland and 25 miles from San Francisco. The City was incorporated in 1914 and was a sparsely settled largely rural area until the 1950s. The growth rate has been phenomenal since that time; with annexations, the population nearly doubled between 1965 and 1975.

Impacts on Planning and Zoning: In Walnut Creek, early incentives to encourage development near BART later were reduced. Zoning initially was modified to encourage high density construction near the station by reducing parking requirements. However, after construction of one high-rise office building, opposition to such developments increased, and the incentives were repealed. In 1978, new zoning measures were adopted establishing two planned development zones near the BART station where a mixture of retail businesses, offices, and apartments may be located. Pre-BART and post-BART general plans and zoning are shown on the maps on the following pages.

BART's Construction Impacts: The line and station in Walnut Creek are elevated. The BART District acquired a total of 76.4 acres of land in the City, of which 24.5 acres was surplus. The large amount of surplus land was purchased to avoid excessive severance costs, because land parcel sizes were large. The land needed for the BART facilities displaced about 170 housing units and very few businesses. Only 1,000 square feet was in commercial use.

The environmental impacts of the construction were those arising from noise, dust, and dirt, and the activities caused minor inconvenience to drivers and pedestrians in the area. Only one retail store was located close to the construction site; representatives of the management of the store reported no effects on their sales from the construction activities.

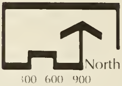
Impacts of the Transportation Service: In March 1978, about 3,800 daily BART trips started or ended at the Walnut Creek stations; three-fourths were work trips. About 12 percent of the total was to downtown Oakland, 26 percent to other East Bay stations, 58 percent to downtown San Francisco, and only 4 percent to other West Bay stations.

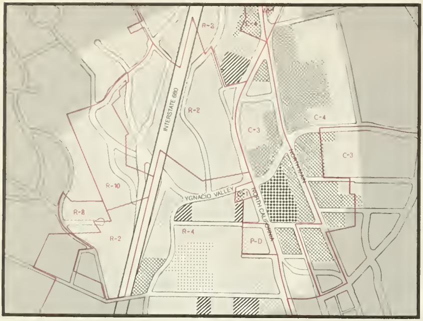
The Walnut Creek station has one connecting BART express bus which serves sparsely settled suburban areas in southern Contra Costa and Alameda Counties. The City of Walnut Creek provides a shuttle bus to the downtown area, and Rossmoor, an 8,000-resident adult community provides shuttle service between the station and the retirement community. Ridership by Rossmoor residents is only about 75 per day, but the shuttle service is a selling point for the community. Fifty-six percent of the patrons of the BART station drive and park; the BART lot is generally 100 percent full by 7:30 a.m. and several hundred automobiles are parked on nearby streets. (The lot includes 156 spaces.) Approximately 11 percent of the patrons come to the station by bus, 8 percent are dropped off by automobile, and 16 percent walk to the station.

BART service has been a factor influencing the decisions of a majority of persons who have recently moved into Walnut Creek. While the major factors

WALNUT CREEK STUDY AREA MAPS

WALNUT CREEK STATION AREA
1965 PRE-BART LAND USE AND ZONING

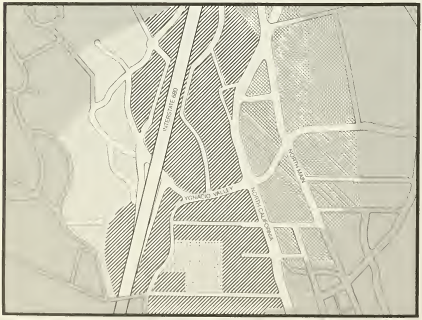




LAND USE	
░	Single Family Residential
▨	Multi-Family Residential
▩	Commercial and Office
▦	Industrial
⠿	Public and Institutional
☐	Vacant
☐	Parking

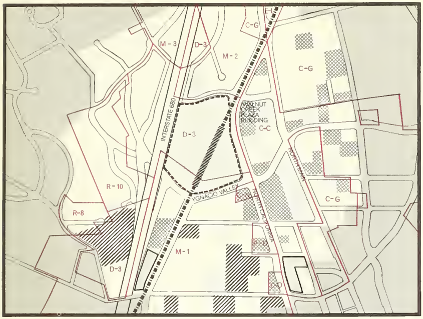
1965 ZONING	
R8/R10/R2	Single Family Residential
R-3	Medium Density Residential
R-4	High Density Residential
C3/C1	Central/Neighborhood Commercial
C-4	General Commercial
M-1	Light Industrial
P-D	Planned Development

1961 GENERAL PLAN



1961 GENERAL PLAN	
░	Single Family Residential
▨	Multi-Family Residential
▩	Retail Commercial
⠿	Institutional

WALNUT CREEK STATION AREA
1965-77 LAND USE CHANGES AND ZONING



BART

- ▥ Station Platform
- ---- Parking
- ■■■■ Subway Line
- ▬▬▬ Surface Line
- ▪▫▪▫ Aerial Line

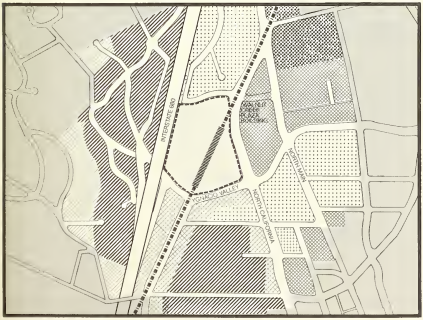
LAND USE

- ▨ Single Family Residential
- ▨ Multi-Family Residential
- ▩ Commercial and Office
- ☐ Demolition (no new use)
- ░ Parking

1977 ZONING

R8/R10/D3	Single Family Residential
M-3/M-2	Low/Medium Density Residential
M-1	High Density Residential
C-C/C-N	Central/Neighborhood Commercial
C-G	General Commercial
E-L	Light Industrial
P-D	Planned Development

1975 GENERAL PLAN



1975 GENERAL PLAN

- ▨ Single Family Residential
- ▨ Multi-Family Residential
- ▩ Office/Retail Commercial
- ▩ Office Commercial
- ⊞ Institutional
- ▦ Auto Sales and Service
- ⁘ Elective Uses
- ☐ BART Station

in their original decisions to move did not involve considerations of BART's service, 93 percent of the persons moving to Walnut Creek who use BART for commuting, and over 50 percent of those who do not use BART reported the system's service was a criterion in their decisions about where to move. Those influenced by BART tended to be homeowners rather than renters; for them BART represents a protection for their investment if congestion should reach intolerable levels or if gasoline shortages should limit automobile use.

Although about 50 percent of the BART commuters, and 20 percent of the non-BART users expressed a willingness to pay a premium for housing near BART, there was no significant difference in the degree to which BART was important between the decisions of persons moving within a 10-minute walking distance of the station and those moving to distances further away.

BART service has induced some shoppers to patronize stores in Walnut Creek, but it has evidently induced a greater number to go to Oakland or San Francisco to shop. The Shoppers' Survey showed that nearly 25 percent of the persons shopping in downtown Walnut Creek had begun to patronize the area within the last three years, and a higher proportion of new shoppers than long-term shoppers use BART to get to the area. However, merchants who were interviewed felt that BART had caused more trade to be lost to the central cities than Walnut Creek had gained; moreover, the 1976 BART Passenger Profile Survey shows over two and a half times more shopping trips depart from the Walnut Creek station than arrive there. Finally, the Shoppers Survey indicated that a few new shoppers who were interviewed in San Francisco and who used BART to get there had formerly shopped in Walnut Creek. (Three of 48 in San Francisco, and two of 29 in Oakland.) With the introduction of weekend service, shopping patterns probably are changing to a greater degree. Whether Walnut Creek ultimately will gain or lose in retail sales from the BART service can only be determined when patterns of patronage on the weekends have been established.

BART was not a factor in any employer's decision to move to Walnut Creek.

Impacts on New Construction: The new Walnut Creek Plaza building, a 135,000-square-foot, 10-story building constructed across the street from the BART station in 1972, was located there specifically because of BART. This is BART's most striking impact on private office construction outside downtown San Francisco and Oakland. The developer originally planned two high-rise buildings, but abandoned plans for the second, in part because of the changes in zoning regulations. The incentives provided for the high-rise development proved worthless; fewer parking provisions were required, but among employees who work in the building, only 10 percent use BART to get to work. Most drive; this led to shortages of parking spaces, and the owners of the building are currently constructing a parking structure which will double the number of parking spaces.

The developer now believes that BART service did not assist in renting space in the building, but that BART serves to help identify the building.

The Walnut Creek Plaza building served as a trailblazer for office construction in the station area. Before 1972 only one office of any significant size was built in the vicinity. Since that time, nine offices costing between $100,000 and $800,000 each have been built within three-tenths of a mile of the station. Walnut Creek's share of total new office construction in the BART region doubled from about 1.5 percent in the 1960s to 3.5 percent between 1974 and 1976 in terms of dollar value. The share of the City's office construction near BART has risen from less than 5 percent in the 1960s to almost a third of the total value of office construction since 1970.

In addition to the impact on office construction, BART affected the timing, location, and market orientation of three major housing developments in Walnut Creek, but none of these developments are within walking distance of the station. Two of the developments provide rental apartments for middle and upper-income persons, mainly commuters. The third is a townhouse project. Within the station area itself, BART has not affected residential densities to any measurable degree. Much of the multi-family construction near BART occurred prior to 1968 and, according to informants, was not BART-induced.

Impacts on Property Prices and Rents: Speculation in offices and commercial properties occurred around the Walnut Creek BART station, beginning with the construction of the system and peaking one year after service began in 1973. Homeowners north of the station formed a cartel to purchase land in the station area. The Walnut Creek Plaza building was built on land purchased by the cartel; it changed hands several times before being acquired by the developer, and prices rose from $3.50 per square foot to $5.32 per square foot.

While the expectation of BART service had a positive effect on surrounding property prices, BART appears to have caused price reductions for homes in the immediate station area since that time. The annoyances of overflow parking and increased traffic appear to have offset any perceived gain from accessibility to the station. The elevated BART trackway has a slight negative impact on housing prices, but only in a very narrow strip along the line.

Station proximity has had no measurable impacts on residential rents to date. However, commercial rents for properties near the station have increased; some of the increase appears to be attributable to BART.

Environmental Impacts: The major environmental impact of BART service is the parking lot overflow. Any possible acoustic and atmospheric impacts are masked by traffic on the nearby freeway. Visually, the station is compatible with the adjoining freeway and office buildings.

Fremont

Fremont, the southernmost town in Alameda County, is the terminal station on the BART Fremont line. It is about 25 miles southeast of San Francisco along the eastern shore of San Francisco Bay. It was incorporated in 1956 and has changed since that time from a farming community to one of the fastest-growing cities in the Bay Area. The City encompasses 96 square miles of land — almost twice the area of San Francisco -- and unlike Walnut Creek, it has substantial amounts of vacant land. Much of the land around the BART station is vacant. The City has convenient freeway access to Oakland and San Francisco to the north, and to San Jose, 15 miles to the south in Santa Clara County.

Fremont has a number of characteristics of a blue-collar suburb; average incomes are lower there than in Walnut Creek, a number of industrial employers, including the General Motors assembly plant, are located there; and over one-fourth of Fremont heads of households work in Fremont. Only 5 percent are employed in San Francisco, compared to 27 percent of Walnut Creek who work in San Francisco.

Impacts on Planning and Zoning: A recommendation that the Fremont commercial district zoning be extended to the BART station area and that medium-density residential developments be permitted was made part of the Fremont General Plan in 1969. In 1974 the Plan was amended to require housing densities of 50 to 70 dwelling units per acre near the station. However, much of the land around the station remains zoned for agriculture (see the 1965 land use and 1965-77 maps of land use changes on the following pages).

BART was an influence on decisions for $1 million in improvements in Fremont, including a number specifically related to BART such as grade separations for BART and Western Pacific Railroad crossings, a station access road, and street improvements.

BART's Construction Impacts: BART acquired 88.9 acres in Fremont, but displacement was minimal because most of the land was vacant, and BART was built beside the Western Pacific Railroad right of way. Only six housing units were removed for the BART facilities.

Impacts of BART's Transportation Service: In March 1978, about 4,000 daily BART trips began or ended at Fremont. Eleven percent were between Fremont and downtown Oakland; 50 percent between Fremont and other East Bay stations; 36 percent between Fremont and downtown San Francisco, and 3 percent to or from other West Bay stations. About 64 percent were work trips.

The Fremont station has feeder service from the Fremont-Newark area on busses which provide service about every half hour. About 18 percent of Fremont patrons get to the station by bus; 63 percent drive and park, 12 percent are dropped off, and 6 percent walk. The 735 parking spaces provided by BART are fully utilized by about 8:00 each weekday morning and an estimated 500 automobiles park on nearby roads. The station parking lot is being expanded by 360 spaces.

The Fremont Fashion Center is located within walking distance of the BART station. The Montgomery Wards store selected the site because it was believed BART service would enlarge its potential market area. The location decisions for other stores in the area were not related to BART. While analyses of retail sales in the Fremont area did not show any BART effect, some merchants believe BART has adversely affected their sales by its provision of service to shopping centers in San Francisco and Oakland.

BART's influence on employers' location decisions were not specifically studied in the Fremont area. However, no major employers have moved into the area recently, and it is unlikely that BART has had an impact in this regard to date. Neither have residents' location decisions for persons moving to Fremont been investigated. It can be surmised that they are similar to those of persons moving to Walnut Creek, although BART's impacts may be somewhat less pronounced in Fremont because a substantial proportion of persons living there also work in the City.

Impacts on New Construction: According to informants, BART influenced the decision to build the new Alameda County Courthouse on a site four-tenths of a mile from the BART station. Since vacant land is abundantly available, the Courthouse may attract related office activities to the station area in the future. Overall, Fremont's share of new office construction in the three-county BART District has not increased since BART was constructed.

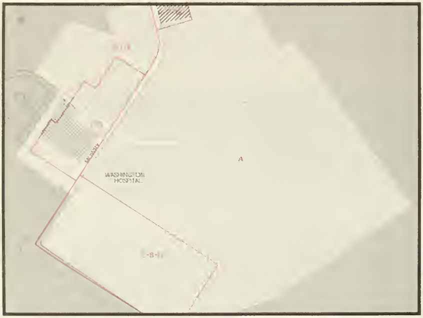
The requirement that new housing in the Fremont station area be relatively high-density developments has apparently deterred new residential construction. However, in December 1977, a plan for a 712-unit condominium complex less than 1,000 feet from the BART station was approved. If completed as planned, this project will be BART's most imposing impact on housing in the Bay Area.

CONCLUSIONS AND POLICY IMPLICATIONS

BART's impacts have been greatest in the urban core downtown areas of San Francisco and Oakland. It provided an impetus for public improvements and policies that served to reinforce the core cities. Lack of neighborhood involvement in station location planning and increased citizen involvement in the planning process during and after BART construction led to downzoning in the Mission and Rockridge Districts that will diminish the potential for BART-induced development in those areas. The Richmond experience illustrates that BART

FREMONT STUDY AREA MAPS

FREMONT STATION AREA
1965 PRE-BART LAND USE AND ZONING



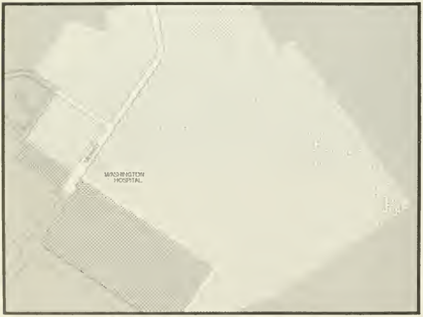
LAND USE

▨	Single Family Residential
▨	Multi-Family Residential
▩	Commercial and Office
⁙	Public and Institutional
▦	Agricultural
☐	Vacant

1965 ZONING

R-1-6	Single Family Residential
R-G-15	Garden Apartment Residential
C-O	Commercial Office
C-B-D	Central Business
A	Agricultural

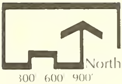
1962 GENERAL PLAN

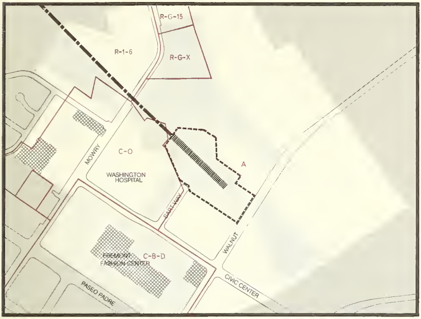


1962 GENERAL PLAN

▨	Low Residential
▦	Agricultural
▩	Professional/Administrative

FREMONT STATION AREA
1965-77 LAND USE CHANGES AND ZONING





BART

‖‖‖‖‖‖	Station Platform
-----	Parking
■■■■	Subway Line
▬▬▬	Surface Line
▪▮▪▮	Aerial Line

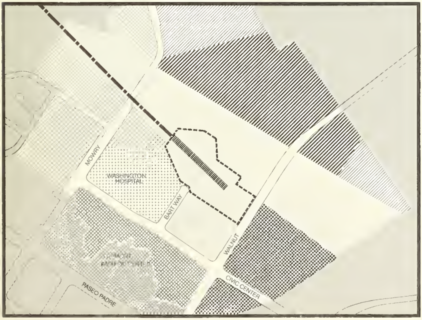
LAND USE

▩	Commercial and Office
☐	Vacant
▦	Parking

1977 ZONING

R-1-6	Single Family Residential
R-G-15	Garden Apartment Residential
R-G-X	Garden Apartment Residential
C-O	Commercial Office
C-B-D	Central Business
A	Agricultural

1977 GENERAL PLAN



1977 GENERAL PLAN

▨	Low Residential
▨	Medium Residential
▨	Very High Residential
▩	Office Commercial
▩	Retail Commercial
⊞	Institutional
▦	Activity Corridor
☐	Transportation Center

is not sufficient to increase demand for housing or retail goods in a declining area. The experience in the suburban case study areas has been mixed; while both adopted some policies to encourage BART-related development, weak demand for higher density, higher-priced housing and insufficient incentives to lower housing costs have limited station area development. On the other hand, BART has influenced locational and development decisions at some distance from the stations. BART impacts in the case study areas are summarized in Table 9-6.

Bay Area decision makers and those contemplating similar rail transit investments might well consider the following policy implications of the Program-Wide Case Studies.

In urban core areas, early planning studies and coordination with redevelopment and other public improvement programs can yield important benefits. Policies to attract office development to a transit-served corridor can be implemented with appropriate development incentives (floor area bonuses for transit station proximity and direct station connections, for example) and disincentives, mainly downzoning outside the core. Downtown retailing also stands to gain if there is regional demand, but without supporting programs to enhance the attractiveness and accessibility of shopping areas, rail transit alone will not have much effect. Finally, decision makers should not expect all these impacts to occur during the first five years of operation; major changes are likely only after years of full service.

In urban residential areas, the importance of citizen participation in corridor studies and route and station selection should not be underestimated. Early citizen involvement can avoid confrontations later on and keep all parties communicating. Local land use policies should reflect realistic expectations of transit-related development; if the impacts on accessibility and mobility are small, little transit-induced development will occur.

In suburban areas, the problems of access and parking warrant careful study. Stations catering primarily to a park-and-ride market should be planned to minimize neighborhood impacts. Station areas slated for intensive transit-oriented development should be selected only if market studies justify demand projections, and the local circulation system could accommodate the additional traffic. Early development should not be expected. Housing and office uses that may generate walk-in transit patronage should be considered viable candidates for suburban station areas with vacant developable land.

Environmental impacts of system operation can be kept at a negligible level through sensitive design. The construction process need not be more than minimally disruptive for at-grade and aerial lines. Subway construction, by necessity, will be more disruptive, partially as a result of the intense nature of development existing in those areas where subway alignments are justified. Every effort

Table 9-6. SUMMARY OF BART'S IMPACTS IN CASE STUDY AREAS, 1962-78

BART Attribute and Impact Category	Urban Core Areas (San Francisco, Oakland)	Urban Residential Areas (Mission, Richmond, Rockridge)	Suburban Areas (Walnut Creek, Fremont)
BART Organization, Planning and Publicity			
Public Action	Land use policy was modified to encourage BART-related development. Beautification and other transit improvements more affected in San Francisco; redevelopment and beautification in Oakland.	Land use policy was modified to restrict BART-related development in Mission and Rockridge; redevelopment was expanded in Richmond.	Land use policy was modified to encourage BART-related development.
Speculation	Minor speculation occurred in Oakland.	Minor speculation occurred in all areas prior to start of service and may be continuing in Richmond.	Minor speculation occurred in Walnut Creek.
BART Acquisition and Construction			
Property Acquisition	Subway construction caused little dislocation in San Francisco; 400 households and 11 acres of commercial and industrial uses were relocated in Oakland.	Subway construction in Mission had little effect; aerial and at-grade construction dislocated 170 and 130 households and 13 and 1 acre of commercial and industrial uses in Richmond and Rockridge respectively.	167 households were dislocated in Walnut Creek; Fremont station area was vacant.
System Construction	Subway construction had a negative effect on retail business for up to 5 years.	Subway construction in Mission had 4-year negative effect on business; few effects elsewhere.	Minimal effects.
BART Service			
Daily Patronage (March 1978)	49,100 trips to downtown San Francisco stations; 13,800 to downtown Oakland. Most work trips come from Contra Costa, Fremont, and Daly City corridors.	5,700 — 2 Mission stations 1,600 — Richmond station 2,200 — Rockridge station Patronage is lower than expected at Mission and Richmond stations. The proportion of BART trips for work purposes ranges from 56 percent in Richmond to 67 percent in Rockridge.	3,800 — Walnut Creek station 3,900 — Fremont station Use of BART for work trips to downtown San Francisco and Oakland is substantial; 64 percent of trips from Fremont are work trips in comparison to 76 percent in Walnut Creek.
Locational Decisions			
- Commercial/ employers	BART was not a decisive factor in San Francisco; but it influenced 3 large employers to locate or remain in Oakland.	BART was key factor in Social Security and Kaiser location decisions in Richmond.	
- Households		Very minor effects occurred in Mission.	BART was a significant factor for some Walnut Creek households.
Development Decisions			
- Commercial/ employers	BART reinforced, possibly accelerated development in Market Street area, but BART was not major location criterion in San Francisco; in Oakland, most new office space in station areas was built in part because of BART.	BART was a key criterion in Social Security Administration and Kaiser Medical building location decisions in Richmond	BART's greatest influence was on one major office building in Walnut Creek.
- Residential			Several projects in Walnut Creek were influenced (not in station area); station area BART-related project was approved in Fremont.
Property prices and Rents	BART had a minor positive effect on commercial rents within 100-200 feet of a station entrance.	BART had an impact on residential property prices in the 24th Street station area of the Mission before service began. It has since disappeared.	BART had a small positive effect on Walnut Creek residential property prices within several hundred feet of a station before service began, and a negative effect since 1972. It also had a positive effect on Walnut Creek commercial rents.
Retail Sales	BART may be reinforcing central city retail vitality.	No effect.	A shift due to BART from Walnut Creek and Fremont to San Francisco and Oakland was perceived; no statistical evidence.
Indirect Environmental Effects	Indirectly BART contributed to noise, traffic, and visual effects of high rise development.	Minimal effects.	Minimal effects
Facilities and Operation			
Environmental Effects	Station plazas improved public areas.	Mission and Richmond station areas were improved.	Traffic in Walnut Creek station area increased; noise along tracks in Fremont is greater than pre-BART.

should be made to minimize disruption in such areas, and tunnelling (rather than cut-and-cover construction) and "fast track" scheduling, should be used whenever feasible.

From a financing standpoint, a value capture policy -- taxing the increases in property values in the vicinity of a station directly attributable to BART (or other rail transit systems) -- is unlikely to yield substantial revenues early in the life of the system. To date, BART's effects on station area property values and rents have been positive but small, and most station area development cannot be solely attributed to BART. In Walnut Creek, there have been negative effects reflected in decreasing property prices next to the parking lot and the tracks. Consequently, there appears to be little justification, at least at this time, for building a financing plan around a value capture principle because the value induced by the system simply is not very large.

The leverage BART provided local redevelopment agencies in allowing them to increase project size with local "credits" gained from BART's construction costs suggests much can be gained from community development programs built around multiyear financing of redevelopment projects and other public improvements. While the current federal Community Development Block Grant program does not recognize the merits of this type of symbiotic relationship, further federal initiatives in this policy area may be forthcoming with implementation of the Urban Mass Transportation Administration's Joint Development Program.

10. CONCLUSIONS AND IMPLICATIONS

To sum up, BART has influenced land use and urban development in the Bay Area both directly (through its service and its local physical effects), and indirectly (by affecting zoning regulations, redevelopment financing, and civic improvements). To date, the effects have been small relative to expectations, but not inconsequential. Both behavior patterns and development decisions have been affected, and the benefits of BART are reflected in small property price and rent increases near stations. At a regional scale, these land use impacts are not discernible because they are not large, but development within the BART corridors is measurably different than it would have been without BART. These impacts, however, have not been as large as anticipated by BART's planners. But given current patronage levels and the relatively short period of BART's service, these findings are credible. Some general observations on the nature of BART's land use impacts will place these individual assessments in perspective.

First, BART's influence works together with other forces affecting individual location and investment decisions and, consequently, urban development patterns. BART cannot be singled out as the causal factor in itself, but rather should be viewed as one component influencing decisions, particularly public decisions. In some instances, BART was an important feature in planning and implementing redevelopment projects, urban beautification, and modifications to zoning policies. Likewise in the private sector, although BART did not increase the amount of development or rejuvenate declining neighborhoods, it did shift demand from one area to another, again in conjunction with other public policies.

Second, although BART cannot be credited with major land use changes, high density housing development, or downtown office construction, it may have prevented further decentralization by improving accessibility to San Francisco and Oakland, and served to demonstrate a public commitment to the older core cities. In this vein, BART serves existing patterns of urbanization well. It facilitates continued centralization of office employment and supports downtown retailing. Where these are not accepted regional objectives, rail systems similar to BART should not be built.

Third, physical characteristics (particularly blight) and social problems (often racial) can effectively counter well-intentioned policies to foster intensive station area development. This occurred in the Mission District around the 16th Street station, in downtown Richmond, and in downtown Oakland. Transit-related developments will occur **only** if there is sufficient regional demand for such uses.

Fourth, because BART has no transportation monopoly and is competing with well-established and subsidized alternatives, it has little inherent leverage.

In addition, it has no entrepreneurial authority such as authorization to engage in and promote land development, so it cannot exploit the potential it creates. Despite these limitations, BART significantly enhances transportation and travel options. This impact, not reflected in current ridership rates, may prove important in influencing urban development over the long run -- a factor which is addressed in the next section on expectations.

Fifth, BART's differential impacts on minority populations are not dramatic and, for the most part, can be traced back to the original design decisions favoring service for the long-distance commuters. BART does not serve minorities living in the inner cities as well as it serves suburban residents commuting to downtown San Francisco and Oakland. However, if income is held constant for suburban residents, BART's influence does not differ by ethnic status, but rather by workplace. To the degree that some minority workers have a greater central city orientation, they may particularly gain from BART. The continued centralization of employment also is beneficial to inner city residents, both minority and non-minority, because employment opportunities for them are improved.

Last, and possibly most important, is the finding that BART's greatest impacts to date may have been on behavior, rather than on land use. Changes in shopping behavior and in the location decision processes of households and employers to reflect the availability of BART service may lead to further land use changes, and continued monitoring of these effects will increase understanding of the impact process and BART's ability to affect urban form.

EXPECTATIONS

Several factors may tend to increase BART's land use impacts in the future. As train frequency and reliability are improved, BART's image will be enhanced and patronage will increase. At that point, BART will have a greater influence on location decisions, which, in turn, will affect both corridor and station area demand for housing and facilities. Further, the current low level of multi-family construction will **not** be permanent in the face of growing housing demand and diminishing supplies of buildable land in the BART service area. When multi-family housing starts increase, station area sites may be favored by developers because of household demand for BART-oriented housing, as well as zoning policies encouraging higher density station area housing in some communities.

A third factor potentially affecting BART's influence will be increasing congestion and delays on competing modes. As highways, the Bay Bridge, and the Caldecott Tunnel approach or exceed capacity, BART's transit time advantage will increase and patronage could rise as a consequence.

Even at present patronage levels BART will have a long-term effect on Bay Area urbanization patterns. Station area workplace and residence locations are favored by BART commuters and others who view BART as a means of keeping their transportation options open. Over time this will make BART-served corridors more attractive than areas without BART service. Downtown retailing in San Francisco and Oakland also should benefit from BART. Some increases in station area densities may occur, but these increases are unlikely to be very dramatic and will be only partly due to BART. Where vacant land exists near BART, it may be developed sooner than if BART had not been built, but clusters of high density station area residential development are improbable, at least over the next five to 10 years with present levels of BART service.

If BART improves service significantly and the parking problems at suburban stations are solved either with new structures or improved feeder bus service, the prospects for more corridor land use changes attributable to BART become greater. Patronage is likely to increase as reliability improves, traffic congestion increases, and suburban communities served by BART grow. As a consequence, the value of locations served by BART should increase, and higher density residential and commercial development could occur in station areas. By making it easier to drive to stations, additional station parking structures may serve to decrease long-term potential for housing intensification in station areas. If parking additions are more limited, BART users whose housing needs change may be more inclined to seek housing within walking distance of stations, making intensification more feasible.

A cautionary note, though, is in order. Even with a doubling of patronage, these land use effects are not going to be as dramatic as originally expected simply because so many other factors affect land use patterns, and the opportunities for change are limited. The most visible effects should be expected around downtown stations and stations with vacant developable land in the vicinity. Where BART station areas already are developed, BART will not cause redevelopment unless other conditions also are present, such as deteriorating structures, strong market demand, and supportive land use policies and zoning regulations.

IMPLICATIONS FOR OTHER CITIES

The most important finding of this study is that BART's effects are greatest where other supportive factors also are present: zoning, public redevelopment, strong market demand, developable land, and community support. Without these, a rail rapid transit system has very little influence on land use and urban development patterns in a well-developed and stable metropolitan area. On a positive note, the BART experience shows how a rail transit project can be a catalyst for local planning and decision making, prompting commitments to other public improvement programs designed to improve the quality of urban life.

During initial planning and route selection studies, close coordination with local governments and with developers, financial institutions, and citizens' organizations can yield important benefits. Opportunities for related public improvements should be identified, funded, and scheduled to minimize disruption and to provide necessary supporting infrastructure for anticipated station area development. Expectations, though, should be based on a careful analysis of demand and the cost and availability of developable land. Unrealistic projections can jeopardize a project's viability, sometimes with unfortunate fiscal consequences as the Richmond case study showed.

Ways of meeting parking demand or providing alternative modes of access such as feeder busses require early attention in the planning process to avoid the adverse effects of overflow parking that occurred with BART. Eliminating some parking spaces to reduce costs is a false economy. Options might include (1) initially acquiring additional space beyond forecasted need, to be maintained in an interim use until required for patron parking, (2) building satellite lots or negotiating joint use of nearby shopping center lots combined with a shuttle bus service, or (3) expanding feeder bus systems, possibly in conjunction with disincentives or restrictions on on-street parking near stations.

The concept that people want to keep their transportation options should be considered in system design, particularly in analyzing transit alternatives and evaluating joint development opportunities. In an area already well-served by transit, a new system or major improvement is unlikely to have much effect on location and development decisions and, consequently, land use patterns; but where transit service had been poor or nonexistent, opportunities for changes will be greater. Employers may represent an exception to this rule because some seek access to a specific labor force. A transit improvement increasing access to central cities may enable some firms that otherwise would move out to remain there.

Along this same vein, BART's effects on shopping patterns suggests that a major rail transit investment can draw new customers into central city stores, but the increases will not be dramatic. Direct tie-ins to stations help, suggesting that formal joint development strategies might be even more successful. However, BART did not participate in such projects, so the effects of this approach could not be evaluated.

In suburban communities and residential neighborhoods, rail transit will not have a nucleating effect, inducing high density housing around stations, unless the demand for such housing is strong, station area sites are available and appropriately zoned, and alternative locations for this type of development are limited. Rapid rail transit systems similar to BART will tend to reinforce existing patterns of urbanization and may have a small effect on corridor development patterns. However, rail transit is neither a necessary nor sufficient condition for development projects. Supportive public policy can help shift demand into station areas, but zoning restrictions elsewhere combined with incentives at stations (increased densities, decreased parking requirements, convenient pedestrian access, etc.) are essential.

Finally, the "impact area" of a rail transit station should not be narrowly defined as easy walking distance, but should encompass neighborhoods and commercial districts accessible by bus or car. Evidence from the surveys of downtown workers, shoppers, and households, and developers interviews showed BART's influence to extend well beyond the 1,500-foot cordon. However, property price and rent increases reflecting benefits of being near a transit station should not be expected outside an immediate zone of influence, extending 500-750 feet from a station in commercial areas and 1,000-1,500 feet in residential areas.

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LAND USE AND URBAN DEVELOPMENT PROJECT DOCUMENTATION

Following is a list of reports prepared for the Land Use and Urban Development Project, organized by impact category. These reports are available through the National Technical Information Service, Springfield, Virginia 22151.

Research Plan

1. John Blayney Associates/David M. Dornbusch & Co., Inc., **Study Design and Project Implementation Plan,** Planning Document, Document No. DOT-BIP-PD-27-5-77, Berkeley: Metropolitan Transportation Commission, March 1977.

   This document contains the research objectives, technical approach, management framework, schedule, and budget for the Land Use and Urban Development Project of the Bay Area Rapid Transit (BART) Impact Program.

Impact Category: BART's Consumption of Land and Property

2. John Blayney Associates/David M. Dornbusch & Co., Inc., **BART's Consumption of Land and Property,** Working Paper, Document No. DOT-BIP-WP-55-5-78, Berkeley: Metropolitan Transportation Commission, March 1978.

   This working paper documents BART's consumption of land and property in terms of the characteristics of business and people displaced, describes the relocation process, and examines development on surplus land BART acquired and subsequently sold. Study methods included statistical analysis of parcel data obtained from the BART Real Estate Department and the California Department of Transportation, a small survey of households and firms receiving relocation payments from BART, and key informant interviews with persons knowledgeable about BART's real estate activities.

Impact Category: BART's Construction Impacts

3. John Blayney Associates/David M. Dornbusch & Co., Inc., **Study of BART's Construction Impacts,** Working Paper, Document No. DOT-BIP-WP-48-5-78, Berkeley: Metropolitan Transportation Commission, April 1978.

   This study examines the effects that BART's construction activities had upon retail sales and services and upon real property. Key informant interviews were supplemented by longitudinal data on taxable retail sales and on permits for construction in areas near BART. Many retail merchants near the sites of BART cut-and-cover construction claimed to have suffered losses in sales during the period. Property owners and builders were found not to have deferred or eliminated maintenance, rehabilitation or new construction near BART construction.

Impact Category: Accessibility Mapping

4. John Blayney Associates/David M. Dornbusch & Co., Inc., **Accessibility Mapping,** Working Paper, Document No. DOT-BIP-WP-36-5-77, Berkeley: Metropolitan Transportation Commission, March 1977.

   This working paper addresses BART's effects on accessibility at a regional scale and within station areas. Several accessibility measures are presented, and differences between BART and the No-BART Alternative (NBA) are delineated. Auto access times to selected BART stations are mapped and compared with the frequency distribution of travel times to BART reported in the MTC Passenger Profile Survey of 1976.

Impact Category: Station Area Land Use

5. John Blayney Associates/David M. Dornbusch & Co., Inc., **Station Area Land Use,** Working Paper, Document No. DOT-BIP-WP-39-5-77, Berkeley: Metropolitan Transportation Commission, November 1977.

   This working paper summarizes time series data on BART stations compiled for the Land Use and Urban Development Project. Data collection and classification methods are described, and data sources are documented. Station area land use changes during the period 1965-77 also are summarized.

Impact Category: Workers' Location Decisions

6. John Blayney Associates/David M. Dornbusch & Co., Inc., **Study of Workers' Location Decisions,** Working Paper, Document No. DOT-BIP-WP-38-5-77, Berkeley: Metropolitan Transportation Commission, November 1977.

   BART's effects on workers' location decisions in San Francisco and Oakland are investigated. A stratified sample of 314 workers was interviewed to determine factors affecting location decisions and the relative importance of BART in workplace choice, current and prior commuting patterns, and socio-economic characteristics. BART's effects on residential location decisions, as influenced by job location decisions, also are examined.

Impact Category: Households' Location Decisions

7. John Blayney Associates/David M. Dornbusch & Co., Inc., **Study of Households' Location Decisions**, Working Paper, Document No. DOT-BIP-WP-47-5-78, Berkeley: Metropolitan Transportation Commission, February 1978.

   This working paper examines BART's effects on households' location decisions in San Francisco's Mission District, suburban Walnut Creek, and East Oakland. In each study area, randomly selected households that had moved in the 1975-76 period were interviewed by telephone to determine factors affecting moving and location decisions, the relative importance of BART in neighborhood choice, current and prior commuting patterns, workplace location, and socio-economic characteristics of respondents. Reasons for moving from one neighborhood to another are summarized, and BART's role in the decision making process is described, with particular attention to the issue of who is influenced by BART. A multiple regression model explaining the importance of BART in residence choice in terms of workplace location, current and prior BART use, work trip length, occupation, age, income, ethnicity, and household composition also is presented.

Impact Category: Employers' Location Decisions

8. John Blayney Associates/David M. Dornbusch & Co., Inc., **Study of Employers' Location Decisions**, Working Paper, Document No. DOT-BIP-WP-46-5-78, Berkeley: Metropolitan Transportation Commission, March 1978.

   This working paper examines BART's influence on employers' location decisions in the three-county BART service area. Individuals who had participated in or who were familiar with their firm's location decisions were interviewed, and relevant interviews from other studies of the BART Impact Program were reviewed. Specific issues addressed in this paper include BART's direct and indirect effects on location decisions, BART's influence on centralization or decentralization of businesses and industries, and the extent to which firms have located near BART in order to gain visual exposure.

Impact Category: Office Construction Industry

9. John Blayney Associates/David M. Dornbusch & Co., Inc., **Study of the Office Construction Industry**, Working Paper, Document No. DOT-BIP-WP-33-5-77, Berkeley: Metropolitan Transportation Commission, August 1977.

   This working paper addresses BART's effects on the three-county BART service area office construction industry. Building permit data for new and rehabilitated offices throughout the three-county BART area were compiled for the period from 1960 through early 1977. Eighteen year trends in regional and local office patterns were analyzed and specific office construction industry hypotheses were investigated. The hypotheses addressed specific issues of BART effects on regional office patterns, local office location shifts to BART station areas, and the timing of BART-induced changes in office location patterns. Key informants were interviewed to supplement the building permit data analysis. Information from the interviews provided insight into office location decisions and aided the interpretation of the building permit data.

Impact Category: Housing Industry

10. John Blayney Associates/David M. Dornbusch & Co., Inc., **Study of the Housing Industry**, Working Paper, Document No. DOT-BIP-PD-37-5-77, Berkeley: Metropolitan Transportation Commission, September 1977.

    This working paper addresses BART's effects on the housing industry in nine areas: Daly City-Pacifica, Mission District, Fruitvale, Walnut Creek, Hayward, Fremont-Union City, Pittsburg-Antioch, Richmond, and East Oakland. Changes in housing supply and demand during the period 1962-76 are analyzed using building permit records, bank loan disclosure statements, BART Passenger Profile Survey data, and aerial photographs, supplemented by key informant interviews with residential developers, apartment managers, planning directors, and others knowledgeable about the housing market.

Impact Category: Property Acquisition and Occupancy (Speculation)

11. John Blayney Associates/David M. Dornbusch & Co., Inc., **Study of Property Acquisition and Occupancy: BART's Effect on Speculation**, Working Paper, Document No. DOT-BIP-WP-45-5-78, Berkeley: Metropolitan Transportation Commission, April 1978.

    This working paper addresses BART's effects on speculation in real estate in the three-county BART service area. Information from interviews with key informants was combined with quantitative analyses of data assumed to be indicative of speculation at eight study sites throughout the service area. The resultant station-specific syntheses were further synthesized to deduce observations applicable to more than one station area. The study addresses specific issues of the timing and the extent as well as the character of BART-induced speculation.

Impact Category: Retail Sales and Services

12. John Blayney Associates/David M. Dornbusch & Co., Inc., **Study of Retail Sales and Services**, Working Paper, Document No. DOT-BIP-WP-50-5-78, Berkeley: Metropolitan Transportation Commission, April 1978.

This study focuses on how BART is influencing the distribution and volume of retail sales in the BART service area. A shopper survey was conducted, retailers were interviewed, and sales tax data analyzed to determine BART's effects. Findings indicate that BART may be having an intra-regional effect on shopping patterns, favoring downtown San Francisco, Oakland, and Walnut Creek. Retailers, however, were found to view BART as an unimportant factor in their location decisions. A relatively small portion of the retailers interviewed stated that BART had a helpful effect on their sales, and sales tax data failed to show positive trends associated with proximity to BART.

Impact Category: **Property Prices and Rents**

13. John Blayney Associates/David M. Dornbusch & Co., Inc., **Study of Property Prices and Rents**, Working Paper, Document No. DOT-BIP-WP-52-5-78, Berkeley: Metropolitan Transportation Commission, July 1978.

    This working paper addresses BART's effects on residential and commercial property prices and rents. Multiple regression analyses were carried out at eight study sites throughout the service area. The separate study site analyses were synthesized to derive observations applicable to more than one station area. At most sites, the data permitted separate analyses of pre-service (anticipatory) effects, immediate, and longer term (post-service) impacts. The study addresses specific issues of the timing of BART impacts as well as joint distribution effects. Information from key informants was also used directly in the study.

Impact Category: **Development Patterns**

14. John Blayney Associates/David M. Dornbusch & Co., Inc., **Study of Development Patterns**, Working Paper, Document No. DOT-BIP-WP-51-5-78, Berkeley: Metropolitan Transportation Commission, June 1978.

    This working paper examines BART's effects on Bay Area, corridor, and station area land use and development patterns. BART's effects on the supply and demand for housing, commercial, and institutional uses are evaluated, using a variety of analysis techniques. These include regional regression analysis of BART's influence on population, housing, and employment; statistical analyses of survey results; and key informant interviews. Particular emphasis is placed on effects on minorities.

Impact Category: **Program-Wide Case Studies**

15. John Blayney Associates/David M. Dornbusch & Co., Inc., **Program-Wide Case Studies**, Working Paper, Document No. DOT-BIP-WP-53-5-78, Berkeley: Metropolitan Transportation Commission, July 1978.

This working paper consists of in-depth, policy-oriented case studies of BART's impacts on selected communities — downtown san Francisco and downtown Oakland, representing urban core areas; the Mission District of San Francisco, the Rockridge neighborhood of north Oakland, and Richmond, representing urban residential areas; and Walnut Creek and Fremont, representing typical suburban residential communities. BART impacts on the natural environment, public policy, institutions and lifestyles, transportation service and travel behavior, as well as land use and urban development are evaluated in terms of pre-BART and no-BART alternatives. Comparative statistics on population, employment, housing, land use and travel behavior are presented, and pre- and post-BART land use and zoning are mapped for each study area. Each case study concludes with an analysis of similarities and differences, and an assessment of the policy implications of the BART experience to date.

Long-Term Monitoring

16. John Blayney Associates/David M. Dornbusch & Co., Inc., **Recommendations for Long-Term Monitoring,** Working Paper, Document No. DOT-BIP-WP-54-5-78, Berkeley: Metropolitan Transportation Commission, July 1978.

    Options for monitoring the impacts of the Bay Area Rapid Transit (BART) system on land use and urban development are examined and evaluated in terms of the importance for policy making, the probability of impact and the measurement feasibility. Analysis techniques are discussed, and monitoring issues in each station area summarized. A recommended long-term monitoring program is presented, including a cost estimate for the first five years.

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